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ELECTRICAL WORLD

McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK CITY. 25 CENTS PER COPY

FEBRUARY 16
1935

OUR NATIONAL RECOVERY NUMBER

ELECTRIFICATION, sponsored and acted upon by the electrical industry, could be the means of bringing about business recovery. The time is ripe for action. Social progress through electrification is supported strongly by popular opinion. Business progress largely depends upon the expansion and intensification of home and factory electrification. Electrical men, long aware of these objectives and markets, are now rallying to a more rapid program of expansion. The industry is ready to go forward.

Thoroughly believing that a great electrical expansion will bring national prosperity in its train, "Electrical World" dedicates itself as a medium for the expression and dissemination of this energizing program initiated by the electrical industry. The March 30 issue will present a simple, concise, unbiased summary of the possibility for recovery of all industry through action by the electrical industry. It will state the case of the industry in terms of past accomplishment and immediate possibilities. It will show the competency of the industry to set recovery in motion.

This is a psychological moment for the accomplishment of this constructive publishing service. The Recovery Number will be written for a national audience and will be presented to congressmen and legislators now in session, and to publicists, financiers and business executives for their information and guidance. It will clear the atmosphere of misunderstandings and encourage a true understanding of what the industry has done and can do right now. The purpose is so laudable and the possibilities are so great that "Electrical World" is glad to act upon this opportunity for essential and extraordinary service.

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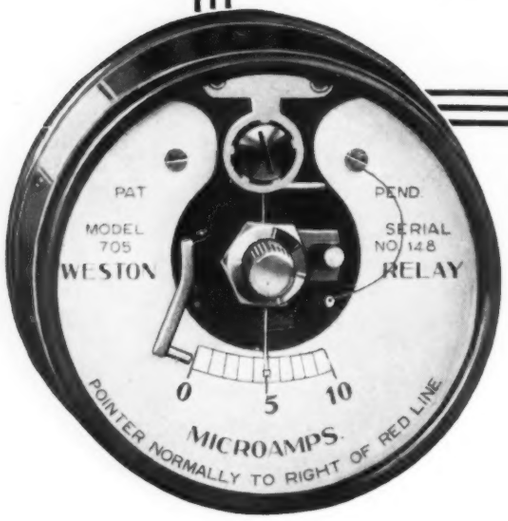
POSITIVE MAGNETIC CONTACT

make WESTON Sensitrol Indicating Relays ideal for many uses



The CO alarm, shown below, recently developed for use in garages, steel mills, chemical plants, etc., employs a Weston Sensitrol Indicating Relay for indicating the CO concentration and sounding an alarm. The relay operates direct from thermocouples. (Manufacturer's name on request.)

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Reader's Guide to This Issue

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Of Executive Interest

	Page
Preserve private operation	25
Rates in cities announced	34
Dealer vs. utility selling	36
Gas competition	40
Slipping salesmen take the meter book	72

For Power Company Engineers

Tube experience in carrier communication	27
Meter trends forming	30
Finds stud terminals better than leads	33
287-kv. line nears completion	54
Preventing bulge of joint sleeves	56

On Power Company Sales

Dealer vs. utility merchandising	36
Gas competition	40
Rates in cities announced	34
Breaking down sales resistance	68
Co-operation builds home laundry sales	68

For Electrical Engineers in Industry

Meter trends forming	30
Finds stud terminals better than leads	33
Built-in motors and control	58
Shoe-drying racks electric heated	61
Over-current relay cuts demand charges	54

For Electrical Manufacturers

Tube experience in carrier relaying	27
Meter trends forming	30
Finds stud terminals better than leads	33
287-kv. line nears completion	54
Built-in motors and control	58

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

CONTENTS

FEBRUARY 16, 1935

Preserve Private Operation 25
By WENDELL L. WILLKIE

Tube Experience in Carrier 27
By PHILIP SPORN and G. G. LANGDON

Meter Trends Forming 30

Finds Stud Terminals Better Than Leads . . . 33
By A. M. BROWN

Rates in Cities Announced 34

Oklahoma-Kansas Experience 36
By EARL WHITEHORNE

Gas Competition 40
Interview with E. R. ACKER

Editorials . . . . . 23 and 42
News of the Week 44
Operating Practices 54
Power at Work in Industry 58
New Engineering Ideas 62
Building Up the Load 68
Men of the Industry 74
New Equipment 78
Letters to the Editor and Book Reviews 82
Recent Rate Changes 84
Sales Opportunities in New Construction 89

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Trends

As Gleaned From This Issue of "Electrical World"

▸▸F.P.C. Readily Compares Rates

From the electrical industry's viewpoint, interest in the first of the Federal Power Commission's rate reports is likely to be concentrated on the basis on which the comparisons are made. Others who draw inferences may not make allowances for the factors that legitimately make rates differ in form and level from place to place. This issue tells the basis of the study in concise manner. It also gives a fairly comprehensive cross-section of the city data. The report shows a little bit of the uniformity for which the commission is very likely to "root" in its final summary in June.

▸▸Should Utilities Merchandise?

Whether merchandising should be left to dealers or participated in by utilities has been a question of considerable debate. Several states have legislated against utility merchandising, although the Supreme Court in at least one such state has declared the legislation unconstitutional. The answer lies largely in what procedure is most effective in rapidly extending the comforts and economies of electrical conveniences, and at the same time permit those who do a good job of promotion and selling to make a fair profit. Four years' experience in Oklahoma and Kansas with dealers selling exclusively is compared in this issue with results before utility merchandising was prohibited in these states. Personal observations are made by the author of "Utility vs. Dealer Selling" regarding the present problem and ways of tackling it.

▸▸Meter Trends Forming

Practices in connection with customers' meters are in the state of flux, largely due to the necessity of counteracting energy diversion. Two outstanding approaches to the problem have been accepted as standard and details of application are now taking shape. Reports from companies having 7,000,000 meters indicate that they are about on the point of deciding how far they will go in the use of outdoor meters, enlarged service entrances and obsolescence replacements. New purchases are being influenced greatly by the extent to which they can be coordinated with existing meters. An analysis of the situation and such conclusions as can be made at this time are presented.

▸▸Regulation of Holding Companies

Agitation for holding company regulation has evidently been stimulated by a combination of circumstances—extreme stock-market fluctuations and the belief that utility rates should drop as much as commodity prices did during the depression. Investments, stock prices and dividends are being confused with rates. Apparently the agitators believe that the high prices of stocks in 1929 were obtained by holding up rates, that rates are based on stock prices, or something of the kind. Mixed with this belief is a feeling that the ratepayer is being penalized by write-ups, issuance of securities, holding company fees, etc. Whatever the cause, federal incorporation or regulation of holding companies has been advocated. W. L. Willkie, president of Commonwealth & Southern Corporation, declares that he prefers regulation of holding companies to government ownership and operation of business. In fact, he welcomes regulation. Why and to what extent are questions he answers in this issue.

Coming Issues

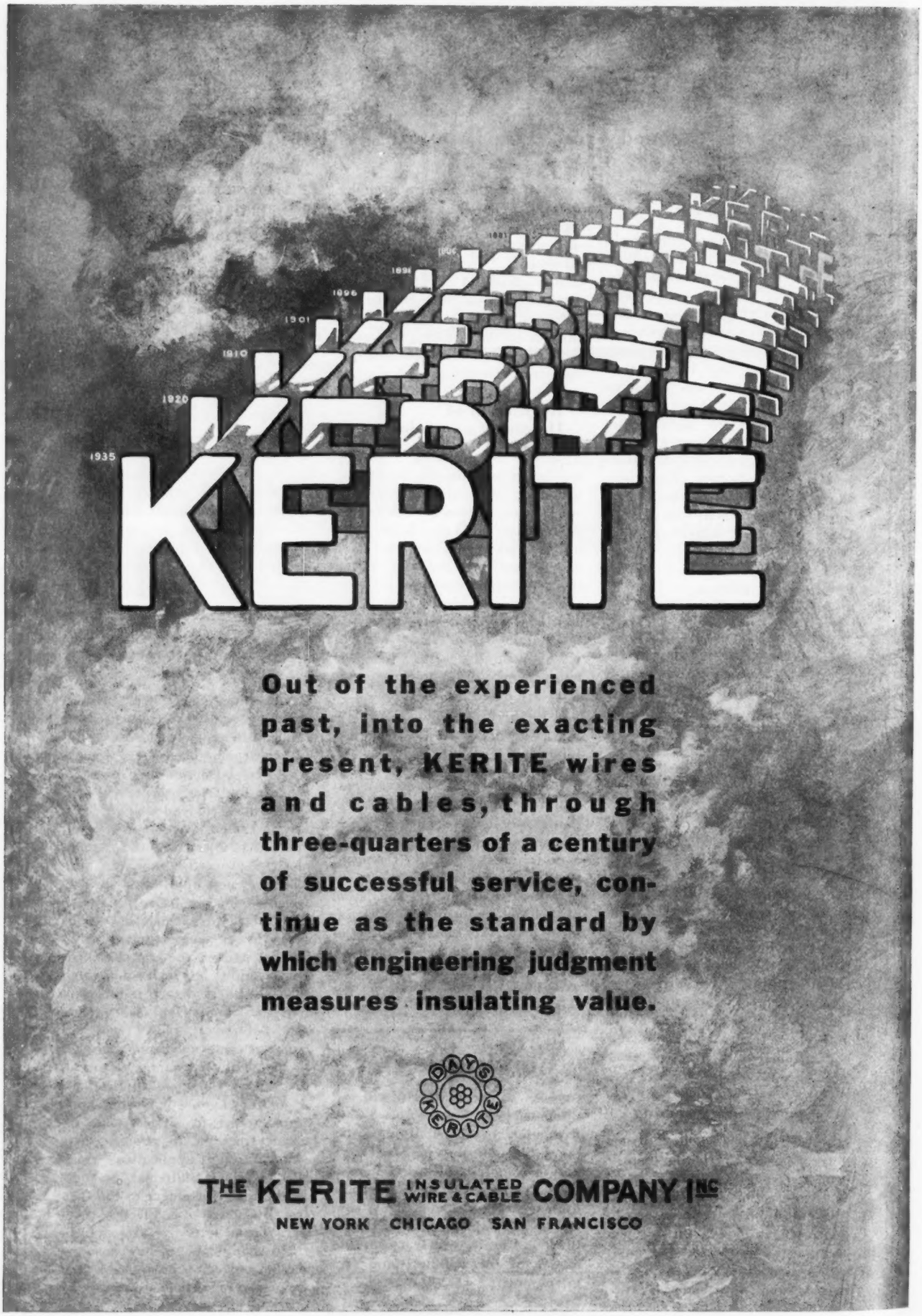
Among subjects which will be discussed in future issue are: Reduction of distribution costs; operating data that pay; selecting network mains; electric enameling, melting and heat treating; industrial plant load-control; control of a.c. unloading tower operations; a simple, widely applicable system of interlocking; and frequency drift.

▸▸Are You Overlooking Benefits?

Electronic tubes are no longer just the tools of radio and communication engineers, but are finding slow but diversified use on power systems and for controlling commercial and industrial operations, as brought out in the A.I.E.E. report and an article by Sporn and Langdon in the February 2 issue. In the current issue these authors submit experience with tubes in carrier communication, indicating that they are *not* unreliable, expensive to maintain nor too complex for practical use. If the benefits obtainable from using tubes in industry are not to be sacrificed, their present uses should be studied and other possible applications considered by operating engineers.

▸▸Gas-Electric Divorce Not the Solution

Combination gas-electric utilities have frequently been accused of refusing to promote electric applications which rob the gas department of business—for example, cooking and water heating. And some critics contend that the only way to extend usage of new developments is to separate the gas and electric properties. Where promotion of new applications merely transfers income from the gas to the electric departments, or vice versa, in the same company, without net gain in the transaction, it can readily be understood that there is no monetary inducement to spend money for such promotion. However, under these circumstances it may sometimes be to the public advantage to switch the service for some applications. And who knows but what such transferrence of service, entailing no net increase in revenue, may stimulate other applications which will develop additional revenue. E. R. Acker, president of the Central Hudson Gas & Electric Company, in an interview presented in this issue, points out how both the public and company interests can be preserved without divorcing the gas and electric properties.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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

FEBRUARY 16, 1935

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Back to Realities in Business

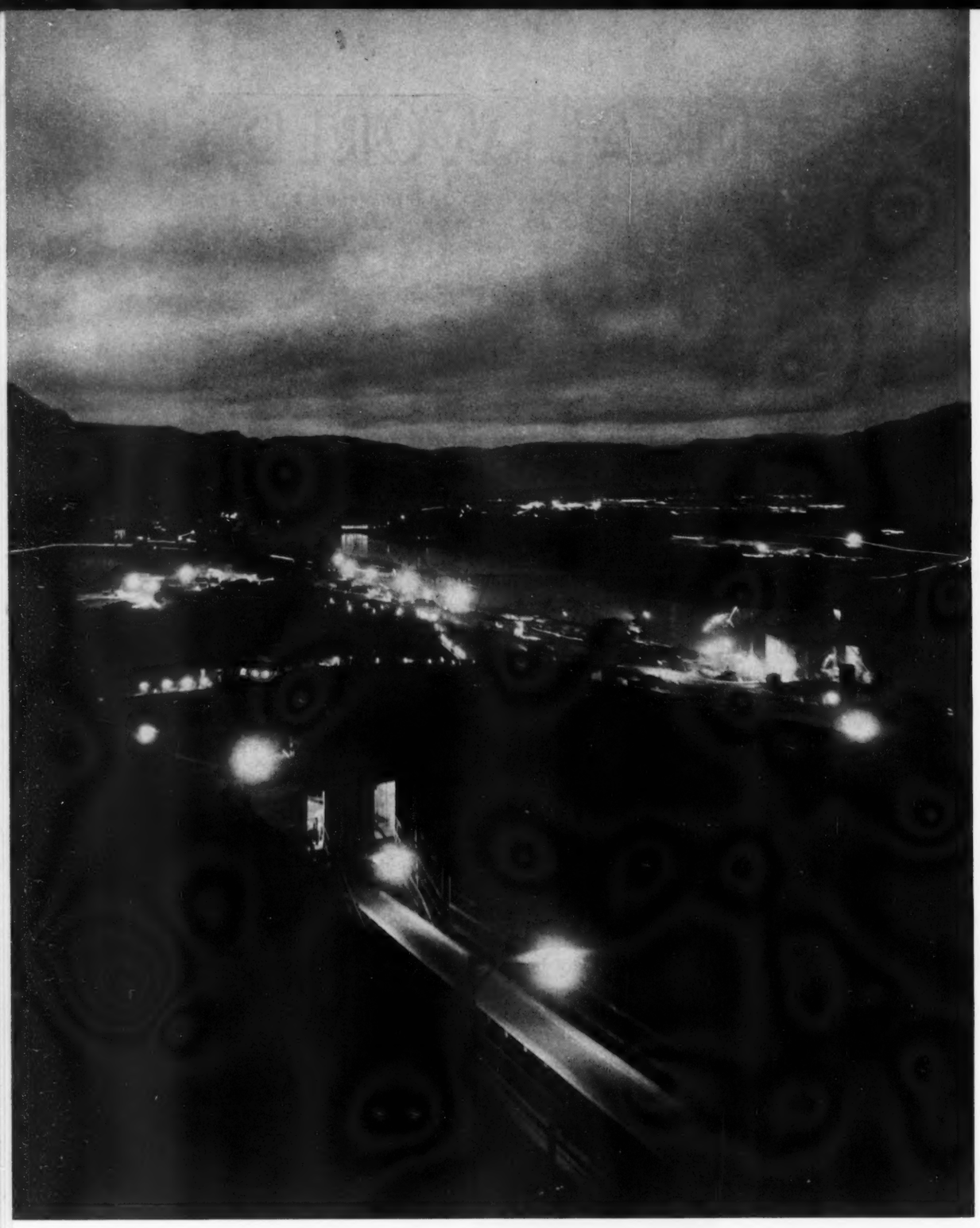
ELECTRICAL manufacturers met together this week to discuss their mutual problems. They found themselves in an encouraging environment. Individual reports indicated active negotiations for new business and an increased volume of business on hand. The code, labor and Washington situations had improved considerably. Basic business figures for all industry showed that a considerable business rally is on in this country, and all admitted that electrification is the process whereby a still greater business growth will occur. Electrical manufacturers are back to a basis of reality and are ready to do their part in building prosperity for the electrical industry.

With respect to the code situation, most of the manufacturers now know what results can be had. The whole subject has been explored and the definite advantages and disadvantages determined. With a remote possibility for code amendments in the near future, manufacturers will use their present code and make their operations conform to its provisions. It contains the fundamental principles upon which to build essential business practices. And experience indicates that it is impossible and probably inadvisable to codify detail trade practices and operations. There are too many human traits to consider, too many specific situations and too much complexity in the business to permit of this standardization or codification.

Social insurance proposals are not new to electrical manufacturers. Many have instituted plans to this end that have worked well, and all expect to meet any federal or state legislation with open minds and cordial support, provided that it is fair and reasonable. Notable extensions have been made to group insurance and even annuity group insurance plans during the past few months as a part of a program for employee benefit and protection.

IT IS apparent that the manufacturers have more unity and optimism than in some years. They need only business volume. They welcome the new and aggressive attitude of many utilities to co-operate in making more sales. They are ready to join hands with other branches of the industry, either locally or nationally, in market promotion and sales programs. The minor disputes, problems and vexations that exist now, as always, in this or any other group of business men will be washed out if there is a rapid increase in the volume of business.

This meeting was indicative of the fact that the entire electrical industry is now facing realities. Each branch sees the vast markets that are unexploited. Each sees that the rather clumsy relations that have existed between industry branches in the past can be improved to the advantage of all. There is a united front now feasible in this industry. There is a prevailing conception that this industry can get down to work and bring back its prosperity as well as aid national recovery through its own efforts in the marketplace. The time is ripe for some big and courageous moves. They will be made.



NORTHWEST TOWN WITHOUT ANY CHIMNEYS

Mason City, Ore., designed for 8,000 people and serving construction forces on the $63,000,000 Grand Coulee hydro project, does all its heating with electricity purchased from the Washington Water Power Company. Electric flood lamps permit night construction and the ¾-mile conveyor belt in the foreground will be supplemented by other motor-driven construction equipment as work progresses. Washington State College is using this town as a field laboratory for studying the practicability of electric house heating

Preserve Private Operation

Holding Company Serves as Cushion for Senior Securities of Operating Companies—Regulation Is Needed as Much for Governmental Enterprise as for Holding and Operating Companies

By W. L. WILLKIE*
President
Commonwealth & Southern Corporation

IS IT not reasonable to suggest, when we view either the reactions of human nature or look at the precepts of history, that moderation and limitation and checks and regulation are required equally for government as for its citizens, and that if government is to embark on untried adventures, chart a new course and engage in competition with the organizations and institutions of its citizens, its agencies should be subjected to the same or companion regulation? Certainly government should not avail itself of those recourses against which it, itself, has inveighed.

Thus we see that if abuses did occur in the electric utility industry that government operation gives no guarantee of their eradication. As that great genius Thomas A. Edison so well said:

> There is far more danger in public monopoly than there is in private monopoly, for when the government goes into business it can always shift its losses to the taxpayers. If it goes into the power business it can pretend to sell cheap power and then cover up its losses. The government never really goes into business, for it never makes ends meet, and that is the first requisite of business. It just mixes a little business with a lot of politics and no one ever gets a chance to find out what is actually going on.

Personally, I favor federal regulation of utility holding companies and the issuance of their securities, together with adequate regulatory laws to eliminate any future prospect of the recurrence of any claimed evils of the past, and in so far as can be anticipated, any evils of the future. This, however, is a vastly different program from abandoning the tradition of 150 years in this country, that government should remain entirely outside the field of private enterprise.

The traditional function of government has been to regulate, rather than to absorb and commandeer, private business, or stifle and strangle it by vying with it as a competitor. Upon that condition and their belief in the Constitution of the United States and the decisions of the Supreme Court of the United States our 300,000 security holders, for whom I am a trustee, and more than four and a half million others have invested more than $14,000,000,000 in the public utility industry in this country.

"Given unrestrained and unregulated power in a non-competitive business, private enterprise or public officials sooner or later may abuse it. Public policy must be fashioned for the unusual as well as the customary instance. That is the reason I favor the regulation of both public utility holding companies and government operations because I believe that human nature is often weak, and when men are engaged in non-competitive work, the teachings of the preacher, the priest and the rabbi have not been sufficiently inculcated to impose the required restraint."

Such private initiative has advanced electricity to its present place in our home and industrial life. Edison completed his first generating plant for supplying electric energy in 1882, when steam was so securely enthroned as the source of power that none could foresee the great electrical development that would revolutionize the life of the people, give new forms of illumination and electrical entertainment, transform industry and greatly alter methods of transport and travel.

Considering past transitions, the electrical development came with remarkable rapidity. Electric power has been made available to the residents of cities, towns and farms and the industrial requirements of the nation completely supplied. The United States today possesses 50,000,000 hp. of installed generating capacity and hundreds of thousands of miles of transmission and distribution lines. The electric utility industry has 24,000,000 customers, most of whom are families. They use approximately 5,000,000 electric refrigerators, 13,000,000 radios, 2,000,000 electric ranges and myriads of small appliances that tend to relieve the drudgery of household work. A larger percentage of the homes of America are supplied with electric energy than in any other country of the world. The widespread availability of electric power has stimulated research and given new and improved products to the public.

Private operation efficient

Private operation of electric utilities has been technically efficient. Maximum power loads are available on instant demand, as well as during the normal periods of home and business lighting. "Outages" resulting from

*Abstract of address before the Economic Club of New York, January 21, 1935

electrical or other disturbances have been practically eliminated. The supply of electric energy has been constant and reliable. This remarkable achievement has not come about by chance, but through vision, inventive ingenuity and courage through years of patient toil and effort.

A co-ordinated effort

In this marvelous development all elements have played their part—the engineers designed and builded, the operating organizations managed and operated efficiently and effectively, the holding companies combined, co-ordinated, supervised and financed and helped raise the $14,000,000,000. Now, however, in this hour of tragic depression, when all men, whether they were investors in farms, bank stocks, industrial concerns, newspapers or utility holding companies, have suffered great financial losses and are, therefore, readily misled by the predictors of a future free of all loss, the baiter of utilities has selected the holding company as the particular object of attack.

The holding company represents the common equities of utility companies. This common equity, the cushion behind the bonds and preferred stocks, is a necessary element in the stability and progress of utilities and makes possible the senior securities. If any sympathy is to be given to either class, the holder of equity securities should be the recipient, because it is he who takes the risk which has made America's industrial development possible.

The holding company not alone financed and supplied co-ordinated, centralized and scientific supervision, but it made possible the great interconnected generation, transmission and distribution systems existent in this country today which are the admiration of electrical engineers throughout the world. England seeks to copy it in its grid system and the T.V.A. flatters in its imitation.

I am the president of a holding company and I make that statement with pride, not alone because of the past achievements of these great organizations but because of the part they are playing today. By the passage of the T.V.A. act $500,000,000 of operating company property belonging to the holding company system which I represent was unable to finance itself. Let me give you some specific figures applicable to companies in the territory immediately adjacent to the T.V.A. development.

The market value today of the senior securities of the C. & S. operating companies is almost $125,000,000 below the par or stated value or 1929 market value. It was obvious, therefore, that the operating companies in the affected area could not finance themselves, and during the last four years the Commonwealth & Southern Corporation has advanced to these units for refunding and development purposes more than $30,000,000. In other words, it has been the holding company which has made possible the preservation of these operating companies, the lowering of their rates and their nationally heralded merchandise appliance sales program.

A noble task of preservation of private utilities

Those who oppose the utility organization, whether they be holding companies or operating companies, assume an attitude of superior virtue and patriotism. They seek to paint us who represent private enterprise in the utility business as anti-social, unpatriotic and the despoilers of men. I yield to no government official in my social obligations, love of country or fellow-feeling for the struggling masses of humanity. I do not like to make personal references, but I want to say to you that no duty has ever come in my life, even that in the service of my country, which has so appealed to my sense of social obligation, patriotism and love of mankind as this, my obligation to say and do what I can for the preservation of public utilities privately owned. All that I have observed, all that I know and all that I read teaches me that I could do nothing nobler for the future financial stability and political good of my country or the social and economic well-being of my fellow-citizen than to stand firm and unafraid against this foolish fad and fancy of the moment.

TWENTY FOOT-CANDLES IN CHRYSLER SHOWROOM

A. L. Powell

This high horizontal intensity at eye level is obtained with an expenditure of 6 watts per square foot of floor surface. Synthetic white light is produced by 66 ceiling fixtures, each containing one 1,000-watt incandescent lamp and one 450-watt mercury-vapor lamp.

Tube Experience in Carrier

Less Maintenance Required for Electronic Devices Than for Rotating Equipment, Relays and Batteries in Carrier Communication

By PHILIP SPORN . . . G. G. LANGDON
American Gas & Electric Company, New York

THE first application of electronic devices on the American Gas & Electric Company system was in carrier-communication equipment operating over our high-voltage transmission networks. A description of this application up to 1929, including operating experience obtained till then, was presented in a paper before the A.I.E.E. in 1929.

Since then this carrier system has been expanded and improved both as to uses and equipment. This will be discussed later. The high-voltage capacitors originally installed solely for carrier communication have been utilized also for carrier-current pilot relaying and for obtaining 60-cycle power for the operation of relays, pilot lights, etc. The original choice of a single frequency per channel for this communication has proved its advantages by permitting the economical application of carrier current for relaying purposes, without making it necessary to use up all of the available frequency channels, as well as by providing the operating advantages inherent in a single frequency per channel.

Message Service—The carrier equipment installed on the 132-kv. interconnected system was intended solely for system (*i.e.*, generation and transmission system) operation, and this has remained its primary function. Nevertheless, during the depression an extensive message service was set up to permit the carrier to be used for general system and administrative purposes. These messages were handled by the station operators at such times when the carrier channel was not in use for system operation and were repeated where necessary over the private telephone system. By this means a saving in telephone expense was made which, for example, amounted to an average of about $250 per month in one typical division.

New Equipment Developments—Based on a study of the maintenance and performance characteristics of the carrier equipment a number of improvements were made in these sets, some of which are enumerated below:

1. Standard desk stands were replaced with monophones when replacement was required.
2. Drain coils were installed outdoors throughout system.
3. Ringing converters insulated from ground.
4. Control rectifier circuit installed on all duplex sets.
5. Per cent modulation increased by adding resistance capacity combination to power amplifier tube, by using more powerful modulation tubes or by rewinding modulation reactors.
6. Additional filtering installed on bias and high-voltage supply where necessary.
7. Automatic volume control installed to minimize receiver overloading.
8. Installed lead-in impedance matching transformers where required.
9. Selectivity filters added.
10. Installed audio equalizer circuits where advantageous.
11. Installed call tube shunt capacitor and 10 to 1 input transformer on type KCA 100 and 8B sets.
12. Voltage regulation of plate rectifiers improved on a.c. type KCA 100 sets.
13. Added vacuum tube voltmeter, capacity meter, commercial tube checkers or set analyzers, test oscillators and portable cathode-ray oscillographs as required to the maintenance equipment.

Parallel with the above equipment developments, advantage was taken of the newer types of receiver tubes to reduce the duty on 6-volt batteries and to obtain better circuit performance.

Practically all of the improvements indicated above or their equivalent have since been included in the latest design of main station carrier set (see illustration).

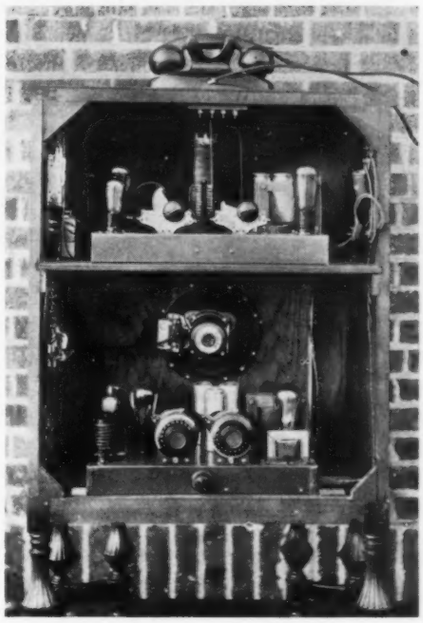


Fig. 1—Simplified carrier telephone provides duplex communication

Rear view of experimental model. The transmitter (top shelf) utilized two type 45 tubes as modulator and oscillator, a type 27 speech amplifier and an 80 rectifier, the transmitter output being in the order of one watt. The receiver used a type 24 radio-frequency amplifier, a type 27 detector, a type 47 audio amplifier and a type 80 rectifier in a conventional t.r.f. circuit.

If electronic devices are moving slowly into functions in power systems it is probably because of fear that they are unreliable, expensive to maintain and involve circuit complexity. That these fears are not well founded is borne out by this record of experience, along with that for other than communication service, as presented in a previous article (see "Electrical World," February 2, 1935). Two later articles will deal with larger power magnitudes of electronic application.

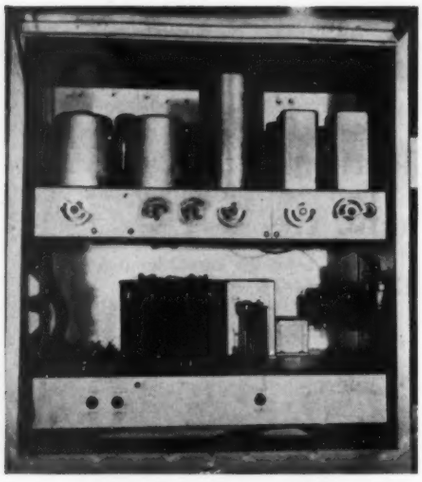


Fig. 2—Commercial design of simplified duplex carrier equipment

Front view. This equipment uses the 60-cell station battery for filament and plate supply. It is designed for outdoor installation and the use of line trap units to obtain maximum coupling and transmission efficiency. The tube complement of the transmitter consists of one 37 speech amplifier and three 48's used as master oscillator, power amplifier and modulator. The receiver uses a 78 radio-frequency amplifier, a type 85 multiple purpose tube as diode-detector, automatic volume control and audio amplifier, and a type 38 output tube.

Experience on Maintenance and Reliability—In Table I the summarized maintenance on 54 main carrier terminals installed on the American Gas & Electric Company system, covering a period of approximately two years, is tabulated.

It is to be noted that tube failures account for seventeen out of a total of 188, or approximately 9 per cent of the service interruptions, as compared to 32 per cent for relays and 16.5 per cent for rotating machines. The data also indicate that poor tubes were located by test and inspection in greater proportion than most other faults. Total communication interruptions averaged about two per terminal per year, but these interruptions did not occur at critical times, such as during storms, any more frequently than at other times, consequently a very high degree of reliability has been obtained during such emergencies.

In Table II is given an estimate of the relative amount of maintenance of the various elements used in these carrier sets. In this tabulation the maintenance ratio for a given item is taken as its per cent of the total troubles divided by its per cent of the total units.

While both tables are of chief interest for locating the weak spots of the equipments themselves, it is evident from the data presented that the vacuum tubes in general require less attention than the rotating machines, batteries or relays, but more attention than transformers, capacitors and resistors under comparable duty cycles. The estimated total maintenance cost per terminal per year in Table II is based on an average of $500 for the year 1930, of which approximately $30 is tube replacements and $20 other replacement material. While the above figure represents no reduction from previous years, the maintenance cost of these equipments has since been reduced approximately 20 per cent. Furthermore, the above maintenance data encompass some of the earliest designs of carrier equipment, some of which have been in service for more than twelve years, and modern design should eliminate a considerable amount of this maintenance, particularly since rectifiers have replaced motor-generators and the duty on batteries, relays and miscellaneous equipment has been reduced.

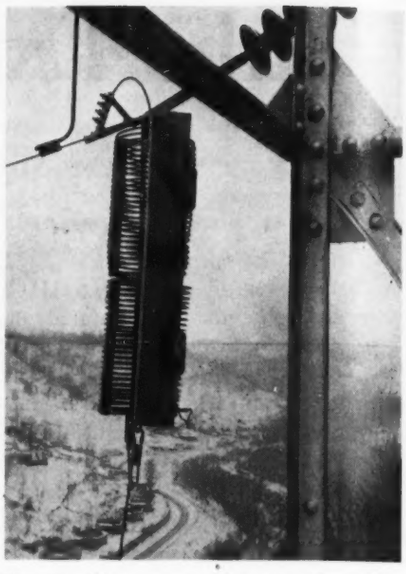


Fig. 3—Line trap units at each carrier terminal

As connected in line conductor chosen for the carrier channel, provides three important advantages: (a) Line losses are reduced to a minimum and a low carrier output (1 watt) can thus provide a high margin against noise, (b) the transmission line does not limit the choice of the carrier frequency or the fidelity obtained and (c) communication is not interrupted by taking the transmission line out of service and grounding it at either end. The two trap units shown above were made up from obsolete lightning arrester chokes which were tuned to anti-resonance at the carrier frequencies by small mica capacitors of the molded type installed in a 6x6x4-in. cast-iron box mounted on each choke coil. The box also contains a protective gap.

Carrier Communication Over Medium-Voltage Transmission Lines—Simplex equipments of low or moderate output have been applied to advantage in some cases. However, the

Table I—Summarized Maintenance on 54 Carrier Terminals on Six Different Companies of the American Gas & Electric Company System

	Co. 1			Co. 2			Co. 3			Co. 4			Co. 5			Co. 6			Totals			Grand Total	Total per Terminal per Year
Class*	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
No. of terminals		6			16			6			3			19			4			54		...	....
Rotating machines	28	7	17	27	15	4	12	1	25	0	5	4	5	3	18	2	0	1	74	31	69	174	1.84
Relays	0	12	31	1	20	66	2	8	26	1	6	21	16	13	27	1	1	7	21	60	178	259	2.74
Batteries	10	1	4	11	2	8	7	1	4	6	0	1	17	0	3	5	0	0	56	4	20	80	0.85
Fuses	0	5	6	2	22	3	0	0	1	0	3	0	0	4	0	1	0	0	3	34	10	47	0.5
Tubes	27	1	4	32	7	4	17	1	1	16	1	1	25	6	2	2	1	1	119	17	13	149	1.57
Connections	2	3	5	1	7	2	1	4	5	1	0	2	1	6	5	0	1	3	6	21	22	49	0.5
Capacitors	2	1	3	11	0	6	3	1	1	0	0	0	5	2	1	1	0	0	22	3	11	36	0.38
Adjustment	3	0	26	0	0	18	5	0	26	0	0	1	0	0	17	0	0	3	8	0	91	99	1.04
Resistors	1	0	1	1	6	1	0	3	12	0	0	0	0	3	2	0	1	1	2	13	17	32	0.33
Transformers	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	3	0.032
Miscellaneous	2	1	14	0	0	6	5	1	9	0	0	1	8	2	8	0	0	3	15	4	41	60	0.64
Totals	76	31	112	86	79	119	52	20	110	24	15	31	77	40	83	12	4	19	326	188	474	988	10.4
Total number of cases	219			384			182			70			200			35			988			988	....
Total cases per terminal per year	20.8			13.7			17.3			13.3			6.0			5.0			10.4			...	....

*1—Troubles located by test or inspection. 2—Interruption cause. 3—Service poor.

requirements involved in various cases differ widely from the standpoint of both operation and economy. Some of the factors which have prevented the greater utilization of the advantages of carrier communication for lower voltage lines are:

1. The cost of equipping these lower voltage systems with carrier communication varies almost directly with the number of carrier sets involved. The distance between communicating stations on these systems is usually short, consequently the cost per station must be kept low in order to obtain an economical application. This means that the equipment must be simple, inexpensive and easily maintained.

2. In a number of cases other forms of communication were already in use, and since only the more complicated and expensive types of carrier equipment were suitable for interconnecting with wire telephone lines, no equipment was available which could adapt itself to an economical changeover from wire line communication to carrier communication.

The first factor was a particularly acute problem at unattended substations since the amount of communication carried on at those points is obviously limited and, therefore, the amount available for communication service is all the more restricted. For such service an experimental carrier equipment was built up on one property of the American Gas & Electric Company system for use in an unattended 33-kv. substation. In this particular case communication was necessary only between the load dispatcher and each unattended substation, party line communication was unimportant, but duplex was desirable. Although communication over the existing public and private metallic telephone systems in this territory was practically always interrupted during severe storms, it was not possible because of the thinness of territory to justify the much greater cost involved for more reliable communication.

The two experimental sets built up for trial on this system in 1932 were made as simple as possible and the cost of coupling the sets to the transmission line was kept low by using a single 45-kv. porcelain capacitor unit, coupled phase-ground. A view of a complete experimental transmitter and receiver is shown in Fig. 1 and a typical coupling installation in one of the illustrations of the preceding article (see ELECTRICAL WORLD, February 2, 1935).

Accurate costs were kept and it was found that the complete cost per carrier installation, including overhead charges, amounted to considerably less than the previous cost. Operation was entirely satisfactory with the exception that at one location room noise prevented satisfactory loudspeaker calling until corrected by the use of an outdoor tuner to secure more efficient coupling to the transmission line. The fidelity obtained is good, the equipments require very little attention and the adjustments are entirely stable.

This equipment was tried out at another location and the possibilities that it seemed to offer in the use of carrier as an economical solution for one type of communication problem were so marked that one of the manufacturers of carrier equipment was approached with the idea of developing a commercial set along similar lines. Such a set was actually developed. Fig. 2 shows a front view of this commercial design, embodying the same principles of low power and simplicity as were first used in its prototype of Fig. 1. Two of these sets are being tried out experimentally on an 88-kv. transmission line in a territory where the application of carrier requires its co-ordination with over 800 miles of transmission line telephone system which is used both for system operation and administrative purposes. This carrier channel forms a self-contained trunk circuit which can be connected to the metallic telephone system at either terminal station and which replaces a section of transmission line telephone circuit which would otherwise require rebuilding. It is intended as the first link of an ultimate communication system, taking advantage of carrier for medium and long hauls, but utilizing the metallic system for short hauls and thus retaining the advantages of both systems.

Operation of this carrier trunk circuit has been satisfactory over the short period of time since its installation in early December, 1934. With minor design changes based on the field experience gained on this installation it is felt that this equipment will be suitable for applying carrier communication not only on this particular system but also on other systems having a similar problem.

Right-hand cabinet contains (from top to bottom):
(a) Selector-rejector circuits.
(b) System receiver.
(c) Inter-system receiver.
(d) Duplex relay unit.
(e) Selective ringing unit.
Left-hand cabinet contains:
(f) Duplex control unit (top).
(g) Combined system and inter-system transmitter.

This carrier equipment uses no rotating machinery or batteries, provides 100 per cent modulation, has adequate receiver automatic volume control and improved fidelity of both transmitter and receiver; the single-frequency duplexing circuit permits any length of two-wire extension to be connected without additional apparatus, and other features are provided. While additional development should indicate some further improvements and simplifications, this equipment represents a marked advance in the design of carrier telephone apparatus.

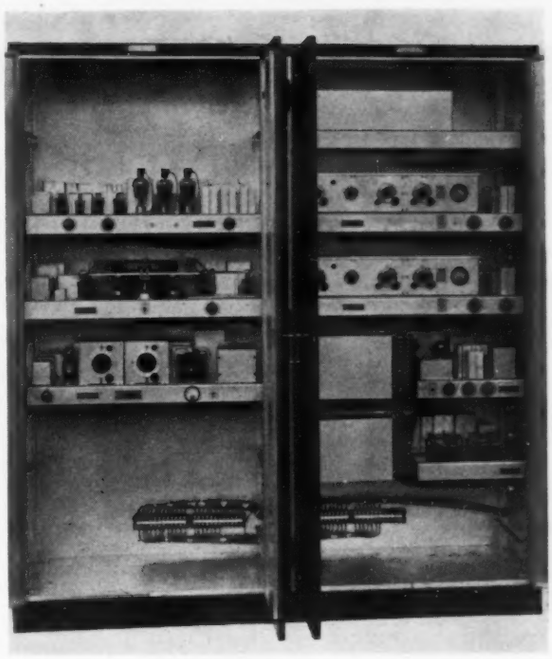


Fig. 4—Carrier telephone set (type KCA-3CC1) installed at Turner, W. Va., 132-kv. substation

Table II—Maintenance of Carrier Telephones—1930 and 1931

Components	Maintenance Ratio	Est'd Maintenance Cost per Terminal per Year*
Rotating machinery	7.5	$84.00
Relays and contacts	5.2	110.00
Batteries (wet and dry)	8.0	66.00
Vacuum tubes	0.6	93.50
Capacitors	0.04	16.00
Resistors	0.048	15.00
Transformers	0.011	2.00
Miscellaneous	...	113.50
Total		$500.00

*These figures include labor, material, traveling expense and overhead.

Meter Trends Forming

New Protective Mounting, Outdoor Installation and Inverted Sequence Are Meeting Diversion—Service Entrance Capacities Being Raised

Metering practice is in a state of flux, occasioned largely by the necessity of counteracting diversion. Two outstanding new approaches have been accepted as standard and the details of application are now taking shape. Many companies are on the point of a decision with respect to outdoor metering, enlarged service entrances, obsolescence replacements, etc. Facts from companies with 7,000,000 meters (even if they have only 1½ per cent of them outdoors at present) will show some measure of the current trends. Meanwhile, consultations between manufacturers and utilities are continuing, with the prospect of still further standardization and improvements.

IT APPEARS that at least twice as many meters will be located outdoors by July 1, 1935, as were so placed on the same date in 1934. Analysis of the estimates of twenty companies having a total of just over 7,000,000 meters shows they had practically 34,600 meters (residential and commercial) outdoors on July 1, 1933. For these and three additional companies (one contributing 25,000 to the 1934 total) the figure had grown to 110,000 a year later. A year hence the estimated figure for those 23 companies is 221,517. Only 8,000 of these will be on commercial service.

These 1935 estimates omit one large company now on the point of a decision, which might make a large increase in the prospective total. Even eliminating three other large metropolitan companies for which outdoor metering is considered quite unfeasible, the estimated program for the year applies to 5,900,000 a.c. meters. The great bulk of the increase is, however, attributable to nine companies. Others are moving slowly. Replies include companies operating in Southern and Western territory, where conditions are most conducive to outdoor installation, and so the figures are significant for all areas.

Dual standard indicated

Thirteen of the companies, representing practically 5,300,000 meters, have adopted as standard or are adhering to the use of the bottom-connected interchangeable meter already known as type A. Three of these will also consider the detachable, socket meter (type S) as standard; they involve just under a million meters. Twelve of the companies with a total of about 3,250,000 meters in service have adopted the type S detachable meter as their standard. One, however, will not begin its use until the middle of 1935, when the present supply of boxes is used up.

Those which will favor the type A are quite divided on the matter of inclosing it. One or two are adhering to their own design of inclosing box; with one exception, they are relatively uncommitted to outdoor installation. Commercially made types of boxes will triple in number of installations. But they are by no means to give way entirely to self-protecting meter designs. As representative of the latter the cast-type of inclosure will nearly double. One utility planning extensive resort to outdoor installation will use the connection block (type B) for this service, although the indicated general standard is type A. Only one answer, and that from a company with less than 50,000 meters, indicated adoption of types B and C (armored or diecast box). It is evident that the preference is strong for the two universal or interchangeable designs (A and S) and that types B and C, lacking full interchangeability, are viewed as having very largely a special application.

Particularly significant totals are possible to report in connection with the transition over a two-year (one past, one coming) period from the long-prevailing to the newer meter assemblies. These figures are principally from thirteen of the companies having about 4,700,000 meters in service. In one large instance the estimates for 1935 are omitted because only a tentative decision has been made as to ruling practice for the future. It seems to hinge on the matter of sequence; the type A meter will be used outdoors in a commercial box if the meter-switch-fuse sequence is decided upon. A company with about 100,000 meters has adopted the switch-meter-fuse sequence meter box for outdoor placing of the bottom-connected interchangeable meter (type A).

Little rebuilding likely

From Table I it may be inferred that rebuilding of meters is not likely to go to large proportions. Also, both the cast and pressed boxes of commercial make are to be used to house the conventional meters when outdoors. It should be emphasized that the bulk of both these totals for 1935 came from two of the companies, one planning to have 10,000 cast boxes and about 65,000 commercial boxes of other design in service, the other planning some 20,000 cast-metal inclosures. The rest of the totals here came largely from five companies. At the very least it may be said that there appears little likelihood of adherence of the utilities generally to inclosures of their own design and fabrication. Only five companies say they will do so and practically all the 1935 increase of 6,000 is due to one company. Availability of equivalent products from the meter manufacturers and box manufacturers has, however, made this generally unnecessary. On the other hand, one company will nearly double its installations of this type.

Of the enterprises reporting, only six indicated they had adopted a well-defined and extensive program for engaging in outdoor metering and only two of the six contemplate changing whole districts entirely from indoor to outdoor. One of these companies will put about 50,000 meters outdoors during the year.

Another company will do it extensively, but only for cases of actual or probable diversion, saying:

All new residential and small commercial services will be served through installation of meters outdoors. Known cases of energy diversion and a limited number of suspected cases will be revamped each year with meters installed outdoors. Ultimately it is expected that practically all residential and small commercial power customers will be served through installation of meters out of doors.

Another company expresses its program this way:

Single-phase installations, 100-amp. capacity or less—On all new installations or existing installations that are to be rearranged in any way that affects the service-entrance conductors or service equipment, the meters shall be installed outdoors with the company's standard meter sockets except in those few cases where outdoor locations are not suitable. Where outdoor locations are not suitable, the meters may, with the company's permission, be installed indoors in suitable locations with standard sockets. These meter sockets will be furnished by the company but installed by the customer.

Answers to this query were, however, predominantly "no" or "not yet," mostly the latter. Even in cases of diversion, actual or probable, it appears that this factor is just beginning to create a ruling trend toward outdoor installation. Summer camps, seasonal occupancy, temporary or wholly outdoor commercial customers, accessibility for reading in outlying areas are cited as frequently as diversion is as reasons for moving meters outdoors. As for unauthorized use there appears to be an intensification of other preventive measures at least equal in general dimensions to outdoor installations. On this point, however, one company says: "Nothing else effective."

Table I—Cast and Pressed Inclosures Both in Favor for Outdoor Metering

Companies (With 4,700,000 Meters) Give Data on Future Program

	Meters in Service Outdoors—		Est'd
	7/1/33	7/1/34	7/1/35
Standard detachable meter (type S)..	254	1,505*	25,475
Rebuilt to detachable, socket type .	0	387	3,805
In cast meter inclosures	2,685	25,376	42,125
In commercial meter boxes	16,306	32,806	88,898
In inclosures of company design	4,554	12,031*	18,980

*One company has 10,000 type S meters outdoors and 18,000 in locally designed boxes, but gives no estimated figure for 1935.

Public Service Co. of Colorado

One company gangs its meters in this way for multiple service from a single entrance

Adoption of new sequence and larger services

Certain properties state they have only a fraction of one per cent or none at all of their meters on the inverted sequence. One reports 10 per cent. Another reports 15 per cent. Several report 5, 6 and 8 per cent. A company which now has about one-half of one per cent states that these are meters installed in outdoor cabinets. Of course this practice is only about four years old and in some areas it is not yet sanctioned as accepted good practice by the regulatory and inspection authorities.

Practice varies widely as to the transition from 30 to 60 amp. service entrance. The majority of the companies range from 70 to 90 per cent on 30-amp. basis at present. In one instance the figure is as high as 95 per cent, and it is not expected that it will be less than that six months hence. On the other hand, one company estimates only 20 per cent of the meters are on 30-amp. services. Reduction of 30-amp. entrances by as much as 10 per cent of all its meters is planned by two companies, one from 60 to 50 per cent, the other from 84 to 74 per cent.

Eleven companies with just under 4,000,000 meters at the middle of 1934 had about 668,000 of their meters on 60-amp. services. By the middle of 1935 this number will be increased by 136,000. Of this amount about 100,000 is due to a single company—the same one which is planning to increase its outdoor meters by about 50,000. On the matter of program in this respect is the following type of comment, given in most instances by companies which omitted mention of specific figures:

All new services required to be 60 amp. since June 1, 1934.

All new installations, plus old installations requiring increased capacity for ranges, etc., must have 60-amp. service equipment. From service rules adopted January 22, 1934—For residential services it is recommended that the minimum service should consist of three No. 6 A.W.G. copper wire in order to provide adequate capacity for the usual electric appliances.

Table II—Meter Purchase Rate for New Service and Obsolescence Is One for 66 in Service

Ampere Rating	Direct-Connected Meters in Service	Annual Purchases for Obsolescene	Annual Purchases for New Services
5	3,492,252	13,050	18,150
10	611,339	2,805	865
15	214,513	7,238	28,905
25	159,388	386	384
50 and up	91,257	599	2,074
	4,568,749	24,078	50,358

We now favor 60 and 100 amp. capacity where we formerly used 30.

In another instance there are more specific requirements about entrance breakers:

Main service switches, either in combination service equipment or individually, should have a minimum capacity of 60 amp., three-wire if they control more than two 15-amp. branch circuits.

If circuit breakers are used, and their use is strongly recommended, the minimum capacity of the main circuit breaker should be 50 amp., three-wire. In single family residences where circuit breakers are used and where there are no more than six branch circuits and the circuit breakers controlling them can be grouped in a common cabinet, the main service circuit breaker may be omitted and it is recommended that this type of installation be made wherever possible. In such installations the branch circuit breakers individually connect directly to the service conductors.

Purchases at low volume

Information can be given about purchasing practice from eleven companies with practically 4,500,000 meters. The buying for both obsolescence and new services is at a startlingly low level. The brief comment of one company, "obsolescence program temporarily suspended," seems to be characteristic of what many might have said had they not recorded the figures. Only one new meter for new services is being bought for every 91 meters now in service. This is not the fault of the companies so much as it is the refusal of the population to grow. But only one is being bought because of partial or total obsolescence of 190 meters in service (Table II). Even part of that low proportion is due to delayed growth in load of individual customers that would make the installed meter inadequate in rating. Acceleration of load building will undoubtedly necessitate buying for that purpose.

Looking, however, at the shifting trend as to sizes, it appears that the 15 amp. capacity is rapidly taking the place of the 5 and 10 amp. capacities. More 15s than 5s are being bought for new services in spite of the fact that there are now only one-twentieth as many 15s as 5s in service. Even the obsolescence replacement of 15s is relatively high, although the entries here may be interpreted as purchases of 15s because of obsolescence of the 5s. There are few 10s and 25s going in for new services and few because of obsolescence.

The significance of obsolescence purchases is partly related to the age of the meters. Fourteen companies with nearly 5,000,000 meters in service find that almost exactly 23 per cent are fifteen or more years old. Something in excess of 60 per cent must therefore antedate the meter with modernized characteristics, because 57 per cent are reported to be more than ten years old. Incidentally, only five of the fourteen companies gave figures that indicate fairly precise records of meters by age. The other seven gave estimates in round figures.

Table III—One Meter in Every Four Over 15 Years Old

Data From Fourteen Companies With About 5,000,000 Meters.

Age	Number of Meters	Per Cent
5 years or less	640,214	12
5 to 10 years	1,612,717	31
10 to 15 years	1,765,387	34
15 years or more ..	1,229,840	23
	5,248,158	100

This question of annual purchase was asked: "Annual purchases because of (a) obsolescence, (b) new services?" Replacement for other causes involves many more meters than the sole occasion of obsolescence. One company states: "Our total annual purchases run approximately 3,000 meters of all classes, of which 50 per cent are for replacement and 50 per cent for new services. Our annual retirements due to obsolescence are running approximately 1 per cent of total meters on the system."

Multiple installations

New measures for multiple installation as well as for sealing and inclosure have been collected in conjunction with this inquiry. These, others pertaining to multiple installations and facts about trends in demand, reactive and kilovolt-ampere metering will appear in future installments.

No attempt was made to ascertain the bettered results obtained after adoption of measures to insure full recovery of revenue from customers. In this connection it may, however, prove of interest to repeat some figures cited to the Northwest Electric Light and Power Association by L. D. Snow of the Puget Sound Power & Light Company., He showed that there was an average increase of 30.6 kw.-hr. per month for some 130 customers who had been making unauthorized use of service. One extreme case was 247 kw.-hr. more; a few, however, used as much as 20 kw.-hr. less after the remedial measures were taken. The diversion had been ascertained by means of pole meters. The conclusion was that diversion prevention is a paying investment even if $50 is spent per suspected customer to check the practice.

Conclusions Supported by Meter Data

The trend from indoor old-sequence to outdoor new-sequence in meter location is definitely established and growing rapidly.

As yet there is only very limited resumption of purchasing of new meters. Meters for outdoors location as required are being recruited mostly by adaptation of meters on hand; indoor type meters in inclosing cabinets thus far prevail.

The type A and type S interchangeable standard meters announced last May are being studied by companies generally as concerns adaptation of meter policies, both as to co-ordinating existing meters and as to purchasing new meters. However, in the five to six months following the announcement of this standard only a minor percentage of companies had reached conclusions or made any conclusions effective.

The 60-amp. service entrance for residential customers is rapidly gaining as required practice.

Stud Terminals Superior

Experience With Distribution Transformers Indicates Superiority Over Units With Bushed Cable Leads

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Commonwealth Edison Company,
Chicago, Ill.

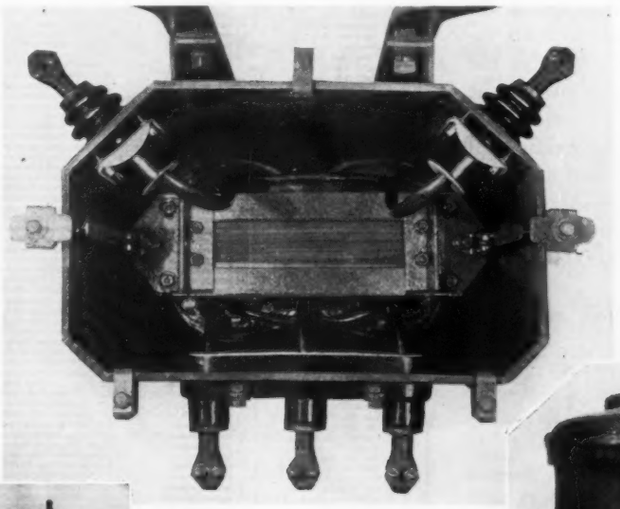
WITH a maintenance replacement rate over a five-year period only one-fifth that of the conventional lead-type bushed distribution transformers, those with stud-type bushings on the system of the Commonwealth Edison Company can be said to have proved the soundness of their design. The material reduction in transformer trouble and resultant service interruption that is indicated by this record is probably the most important achievement of the stud-type bushing. In addition to the intangible value of greater service continuity, four-fifths of the maintenance, replacing and repairing of transformers, at an average cost of $60 each, has been eliminated.

The performance data here cited are taken from records of the 34,000 overhead transformers on the Commonwealth Edison system, of which about 6,000 are equipped with stud-type bushings. These 6,000 have gone through an average of 3¾ lightning seasons with coil failure occurring in only fifteen units. This is one-tenth the usual rate of failure among our lead-type bushed transformers. A critical analysis finds the data not truly comparable because the stud-type bushings have not been in service as long as the lead type. Moreover, the co-ordination of the new bushing with the coil insulation has not yet appreciably affected the statistics. This and other improvements in the first design lead us to expect that the future will show the same high degree of service and low maintenance costs as have the past five years.

Development of the stud-type bushing was begun in 1927 by engineers of the company, with the objective of designing a bushing which would effectively eliminate the syphoning of oil through the leads and be easily replaceable. To accomplish these objectives, it was necessary to depart from the conventional method of entering the transformer with an insulated lead. Instead a bare, solid copper stud was provided as a conductor through the bushing. Obviously this construction (shown in illustration), by eliminating the syphoning medium, namely, the insulation of the lead through the bushing, definitely ended the syphoning of oil out of the transformer.

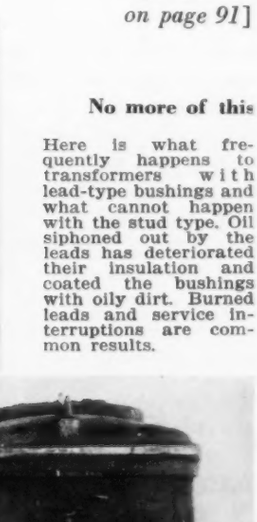
This bushing construction has proved to be desirable and economical in many ways. It makes possible the shipping of transformers filled with oil, which prevents the absorption of moisture by the coils while in transit and makes the handling of oil containers unnecessary. It permits replacing or repairing bushings and leads in the fields without incurring

[*Continued on page 91*]



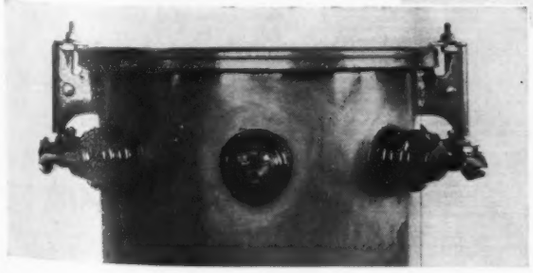
How stud bushings are installed

This cover-removed view shows the construction of the stud-type bushings. Note that primary and secondary terminals are similar, but the former are mounted separately and the latter assembled on a single porcelain block in a slot in the transformer case. To make the stud and bushing assembly leak proof, the stud is drawn up against a gasket inside the bushing by a combination capnut and connector on the outside end. The bushing is held tightly against a gasket on the case by a keeper plate, with several set-screws providing the necessary pressure. The leads from the coils are bolted or brazed to the stud on the inside of the case. The leads to the line are clamped in the connector on the outside end of the stud, thereby eliminating soldered joints when connecting a transformer to the line.



No more of this

Here is what frequently happens to transformers with lead-type bushings and what cannot happen with the stud type. Oil siphoned out by the leads has deteriorated their insulation and coated the bushings with oily dirt. Burned leads and service interruptions are common results.



Studs in a round case

Any type of transformer case can use the stud terminals by simple replacement of the leads.

Rates in Cities Announced

Power Commission Publishes Rate Facts for 191 Cities of Over 50,000 Population Arranged in the Order of Rank

PRICES at which half the nation (actually 49 per cent of all residential customers) can buy electricity are disclosed in the first of the reports of the Electric Rate Survey of the Federal Power Commission. Officially it is a report to Congress on the six months' labor and findings of the staff assembled last July under Dr. W. E. Mosher as director. The information was obtained by questionnaire and verified by correspondence and interview with about 2,000 private companies and as many more municipal enterprises. The document is therefore an authentic picture of the absolute and relative charges at which electric service is available in the 191 cities of 50,000 or more inhabitants.

Comment is kept to a minimum in the report, only such explanation being included as was felt necessary to prevent misinterpretation of the "statisticated" data. All the figures are given in the form of typical bills for certain consumptions that cover the range from the small user's 15 kw.-hr. per month to the large residential user's 500. As was to be expected, the surveyors found such an enormous variety of rates as to leave this as the only practicable way of showing the charges for various communities on a comparable basis. Determination of the numbers of kilowatt-hours to employ was based upon consideration of the electrical appliances used by classified fractions of the 20,000,000 consumers of the country.

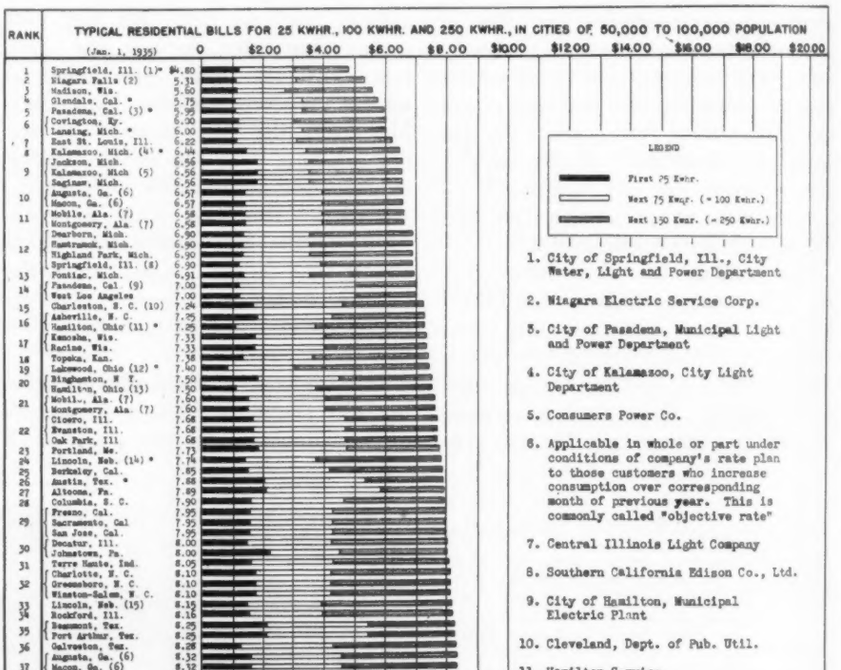
The breakdown resulted as shown in the following:

Class	No. of Customers	Lighting	Small Appl.	Refrigeration	Cooking	Water Heating	Blocks Assumed
I	13,350,000	X	X	..	..	..	15; 25; 40
II	5,310,000	X	X	X	..	..	100; 150
	150 000	X	X	..	X	..	.....
III	870,000	X	X	X	X	..	250
IV	320,000	X	X	X	X	X	500

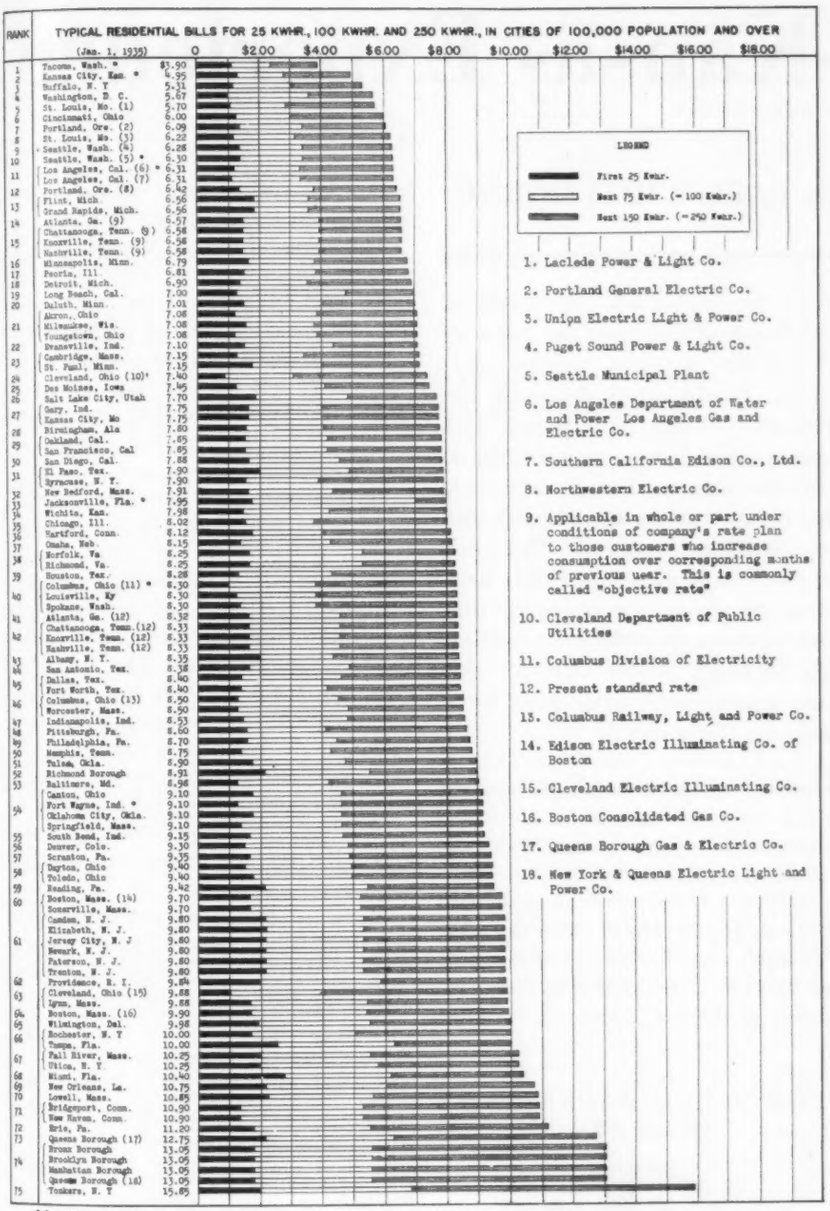
Incidentally, the statement is made that 25 per cent of those in Class I use 15 kw.-hr. or less per month, 50 per cent use 25 or less and 75 per cent use 40 or less. These estimates are apparently founded on well-established surveys by others.

The five-room house was taken as a median and its active floor area as 1,000 sq.ft. or the connected lighting load as 700 watts. To cover the case where demand charges are in force for domestic customers the refrigeration connected load was taken as 300 watts, the electric range as 6,000 watts and water heater 3,000. The respective demands were taken as 600, 100, 2,300 and 1,500 watts where charge is based on metered or estimated demand.

For the case where more than one meter is installed and part of the small appliance energy is metered by the


RANK
TYPICAL RESIDENTIAL BILLS FOR 25 KWHR., 100 KWHR. AND 250 KWHR., IN CITIES OF 50,000 TO 100,000 POPULATION
(Jan. 1, 1935)
0
$2.00
$4.00
$6.00
$8.00
$10.00
$12.00
$14.00
$16.00
$18.00
$20.00
LEGEND
First 25 Kwhr.
Next 75 Kwhr. (= 100 Kwhr.)
Next 150 Kwhr. (= 250 Kwhr.)
1 Springfield, Ill. (1)* $4.80
2 Niagara Falls (2) 5.31
3 Madison, Wis. 5.60
4 Glendale, Cal. * 5.75
5 Pasadena, Cal. (3) * 5.95
6 Covington, Ky. 6.00
Lansing, Mich. * 6.00
7 East St. Louis, Ill. 6.22
8 Kalamazoo, Mich. (4) * 6.44
Jackson, Mich. 6.56
9 Kalamazoo, Mich (5) 6.56
Saginaw, Mich. 6.56
Augusta, Ga. (6) 6.57
10 Macon, Ga. (6) 6.57
11 Mobile, Ala. (7) 6.58
Montgomery, Ala. (7) 6.58
Dearborn, Mich. 6.90
Hamtramck, Mich. 6.90
Highland Park, Mich. 6.90
Springfield, Ill. (8) 6.90
12 Pontiac, Mich. 6.91
13 Pasadena, Cal (9) 7.00
West Los Angeles 7.00
Charlton, S. C. (10) 7.24
14 Asheville, N. C. 7.25
Hamilton, Ohio (11) * 7.25
15 Kenosha, Wis. 7.33
Racine, Wis. 7.33
16 Topeka, Kan. 7.38
17 Lakewood, Ohio (12) * 7.40
18 Binghamton, N. Y. 7.50
Hamilton, Ohio (13) 7.50
19 Mobile, Ala. (7) 7.60
Montgomery, Ala. (7) 7.60
Cicero, Ill. 7.68
20 Evanston, Ill. 7.68
Oak Park, Ill 7.68
21 Portland, Me. 7.73
22 Lincoln, Neb. (14) * 7.74
23 Berkeley, Cal. 7.85
24 Austin, Tex. * 7.88
25 Altoona, Pa. 7.89
26 Columbia, S. C. 7.90
27 Fresno, Cal. 7.95
Sacramento, Cal 7.95
San Jose, Cal. 7.95
28 Decatur, Ill. 8.00
Johnstown, Pa. 8.00
29 Terre Haute, Ind. 8.05
30 Charlotte, N. C. 8.10
Greensboro, N. C. 8.10
31 Winston-Salem, N. C. 8.10
32 Lincoln, Neb. (15) 8.15
33 Rockford, Ill. 8.16
34 Beaumont, Tex. 8.25
Port Arthur, Tex. 8.25
35 Galveston, Tex. 8.28
36 Augusta, Ga. (6) 8.32
Macon, Ga. (6) 8.32
37 Savannah, Ga. 8.32
38 Schenectady, N. Y 8.35
Troy, N. Y 8.35
39 Manchester, N. H. 8.36
40 Cedar Rapids, Ia. 8.53
McKeesport, Pa 8.60
41 St. Joseph, Mo. 8.60
Waco, Tex. 8.60
42 Shreveport, La. 8.75
43 Chester, Pa. 8.80
44 Brockton, Mass. 8.90
45 York, Pa. (16) 8.93
46 Lincoln, Neb. (14) * 8.98
47 Pueblo, Colo. 9.00
Springfield, Mo. 9.00
48 East Chicago, Ind. 9.05
Hammond, Ind. 9.05
Allentown, Pa. 9.06
Bethelehem, Pa. 9.06
49 Harrisburg, Pa. 9.06
Lancaster, Pa. 9.06
Wilkes-Barre, Pa. 9.06
50 Sioux City, Ia. 9.10
51 Roanoke, Va. 9.13
52 Springfield, Ohio 9.20
Charleston, W. Va. 9.25
Durham, N. C. 9.25
53 Holyoke, Mass. * 9.25
Huntington, W. Va. 9.25
Wheeling, W. Va. 9.25
New Britain, Conn. 9.35
54 Waterbury, Conn. 9.35
55 York, Pa. (17) 9.42
56 Little Rock, Ark. 9.60
57 Newton, Mass. 9.70
Quincy, Mass. 9.70
Bayonne, N. J. 9.80
East Orange, N. J. 9.80
58 Hoboken, N. J. 9.80
Irvington, N. J. 9.80
Passaic, N. J. 9.80
Union City, N. J. 9.80
59 Charleston, S. C. (10) 9.84
60 Cleveland Heights 9.86
Lakewood, Ohio (18) 9.86
61 Malden, Mass. 9.95
Medford, Mass. 9.95
62 Atlantic City, N. J.. 10.00
63 Pawtucket, R. I. 10.30
64 Lawrence, Mass. 11.30
Niagara Falls (19) 11.56
65 Mt. Vernon, N. Y. 16.31
New Rochelle, N. Y. 16.31
1. City of Springfield, Ill., City Water, Light and Power Department
2. Niagara Electric Service Corp.
3. City of Pasadena, Municipal Light and Power Department
4. City of Kalamazoo, City Light Department
5. Consumers Power Co.
6. Applicable in whole or part under conditions of company's rate plan to those customers who increase consumption over corresponding month of previous year. This is commonly called "objective rate"
7. Central Illinois Light Company
8. Southern California Edison Co., Ltd.
9. City of Hamilton, Municipal Electric Plant
10. Cleveland, Dept. of Pub. Util.
11. Hamilton Service
12. Present standard rate
13. City of Lincoln, Commercial Light Department. Bills shown are calculated under gross rate applying to customers who increase use over previous year. Five per cent discount for prompt payment should be deducted from rate reported to arrive at net bills under this rate. Information on net rate and rate for customers not increasing use was received too late to be included in tables.
14. Iowa-Nebraska Light & Power Co.
15. Edison Light & Power Co.
16. Present standard rate. City of Lincoln Commercial Light Department.
17. Metropolitan Edison Co.
18. Cleveland Electric Illuminating Co.
19. Niagara Falls Gas & Elec. Light Co.

* Served by municipally owned and operated plants.


TYPICAL RESIDENTIAL BILLS FOR 25 KWHR., 100 KWHR. AND 250 KWHR., IN CITIES OF 100,000 POPULATION AND OVER
(Jan. 1, 1935)
0
$2.00
$4.00
$6.00
$8.00
$10.00
$12.00
$14.00
$16.00
$18.00
LEGEND
First 25 Kwhr.
Next 75 Kwhr. (= 100 Kwhr.)
Next 150 Kwhr. (= 250 Kwhr.)
1. Laclede Power & Light Co.
2. Portland General Electric Co.
3. Union Electric Light & Power Co.
4. Puget Sound Power & Light Co.
5. Seattle Municipal Plant
6. Los Angeles Department of Water and Power Los Angeles Gas and Electric Co.
7. Southern California Edison Co., Ltd.
8. Northwestern Electric Co.
9. Applicable in whole or part under conditions of company's rate plan to those customers who increase consumption over corresponding months of previous year. This is commonly called "objective rate"
10. Cleveland Department of Public Utilities
11. Columbus Division of Electricity
12. Present standard rate
13. Columbus Railway, Light and Power Co.
14. Edison Electric Illuminating Co. of Boston
15. Cleveland Electric Illuminating Co.
16. Boston Consolidated Gas Co.
17. Queens Borough Gas & Electric Co.
18. New York & Queens Electric Light and Power Co.
1 Tacoma, Wash. * $3.90
2 Kansas City, Kan. * 4.95
3 Buffalo, N. Y. 5.31
4 Washington, D. C. 5.67
5 St. Louis, Mo. (1) 5.70
6 Cincinnati, Ohio 6.00
7 Portland, Ore. (2) 6.09
8 St. Louis, Mo. (3) 6.22
9 Seattle, Wash. (4) 6.28
10 Seattle, Wash. (5) * 6.30
11 Los Angeles, Cal. (6) * 6.31
Los Angeles, Cal. (7) 6.31
12 Portland, Ore. (8) 6.42
13 Flint, Mich. 6.56
Grand Rapids, Mich. 6.56
14 Atlanta, Ga. (9) 6.57
Chattanooga, Tenn. (9) 6.58
15 Knoxville, Tenn. (9) 6.58
Nashville, Tenn. (9) 6.58
16 Minneapolis, Minn. 6.79
17 Peoria, Ill. 6.81
18 Detroit, Mich. 6.90
19 Long Beach, Cal. 7.00
20 Duluth, Minn. 7.01
Akron, Ohio 7.06
21 Milwaukee, Wis. 7.08
Youngstown, Ohio 7.08
22 Evansville, Ind. 7.10
23 Cambridge, Mass. 7.15
St. Paul, Minn. 7.15
24 Cleveland, Ohio (10)* 7.40
25 Des Moines, Iowa 7.45
26 Salt Lake City, Utah 7.70
Gary, Ind. 7.75
27 Kansas City, Mo 7.75
Birmingham, Ala 7.80
28 Oakland, Cal. 7.85
29 San Francisco, Cal 7.85
30 San Diego, Cal. 7.88
El Paso, Tex. 7.90
31 Syracuse, N. Y. 7.90
32 New Bedford, Mass. 7.91
33 Jacksonville, Fla. * 7.95
34 Wichita, Kan. 7.98
35 Chicago, Ill. 8.02
36 Hartford, Conn. 8.12
Omaha, Neb. 8.15
37 Norfolk, Va 8.25
38 Richmond, Va. 8.25
39 Houston, Tex. 8.28
Columbus, Ohio (11) * 8.30
40 Louisville, Ky 8.30
Spokane, Wash. 8.30
41 Atlanta, Ga. (12) 8.32
Chattanooga, Tenn. (12) 8.33
42 Knoxville, Tenn. (12) 8.33
Nashville, Tenn. (12) 8.33
43 Albany, N. Y. 8.35
44 San Antonio, Tex. 8.38
45 Dallas, Tex. 8.40
Fort Worth, Tex. 8.40
46 Columbus, Ohio (13) 8.50
Worcester, Mass. 8.50
47 Indianapolis, Ind. 8.53
48 Pittsburgh, Pa. 8.60
49 Philadelphia, Pa. 8.70
50 Memphis, Tenn. 8.75
51 Tulsa, Okla. 8.90
52 Richmond Borough 8.91
53 Baltimore, Md. 8.98
Canton, Ohio 9.10
Fort Wayne, Ind. * 9.10
54 Oklahoma City, Okla. 9.10
Springfield, Mass. 9.10
55 South Bend, Ind. 9.15
56 Denver, Colo. 9.30
57 Scranton, Pa. 9.35
58 Dayton, Ohio 9.40
Toledo, Ohio 9.40
59 Reading, Pa. 9.42
60 Boston, Mass. (14) 9.70
Somerville, Mass. 9.70
Camden, N. J. 9.80
Elizabeth, N. J. 9.80
61 Jersey City, N. J 9.80
Newark, N. J. 9.80
Paterson, N. J. 9.80
Trenton, N. J. 9.80
62 Providence, R. I. 9.84
63 Cleveland, Ohio (15) 9.88
Lynn, Mass. 9.88
64 Boston, Mass. (16) 9.90
65 Wilmington, Del. 9.98
66 Rochester, N. Y 10.00
Tampa, Fla. 10.00
67 Fall River, Mass. 10.25
Utica, N. Y. 10.25
68 Miami, Fla. 10.40
69 New Orleans, La. 10.75
70 Lowell, Mass. 10.85
71 Bridgeport, Conn. 10.90
New Haven, Conn. 10.90
72 Erie, Pa. 11.20
73 Queens Borough (17) 12.75
74 Bronx Borough 13.05
Brooklyn Borough 13.05
Manhattan Borough 13.05
Queens Borough (18) 13.05
75 Yonkers, N. Y 15.85
* Served by municipally owned and operated plants.

large-appliance meter, the following assumptions were made:

Refrigeration	Kw.-Hr.
25 kw.-hr. lighting, 75 kw.-hr. refrigeration...	= 100
40 kw.-hr. lighting, 110 kw.-hr. refrigeration..	= 150
Cooking	
25 kw.-hr. lighting, 75 kw.-hr. refrigeration, 150-kw.-hr. cooking.....	= 250
Water Heating	
25 kw.-hr. lighting, 75 kw.-hr. refrigeration, 150 kw.-hr. cooking, 250 kw.-hr. water heating.....	= 500

With these assumptions established as basic for all calculations, the further proviso that all bills be computed on a net basis and the omission of any local tax item merely *collected by* the utility, the commission staff proceeded to compute the charges and set them up in tabular and graphical manner. The first table (in two parts) embraces in alphabetical order the 93 cities of 100,000 or more and the 98 cities of between 50,000 and 100,000. They show the minimum bill, charges for 15, 25, 40, 100, 150, 250 and 500 kw.-hr. per month. A second table places the cities in the order of rank as to population and as to the charges for each of the blocks of consumption up to 250 kw.-hr. A set of twelve charts is also included to show the same results in graphical manner, each showing the rank for a particular block of kilowatt-hours. Finally, the two charts shown herewith present the results with one bar on the diagram embracing all three of the more typical blocks, 25, 100 and 250 kw.-hr.

The report is careful to caution against making invidious comparisons in rates without taking into consideration factors which can account for wide variations in rates, many of these factors being "due to conditions beyond the control of the companies." Although several of these items are enumerated, no mention is made at this point of the effect of varying proportions of underground and overhead construction, the influence of local restrictive ordinances, soil conditions, tree trimming permission, cost of right-of-way through expensive terrain and similar factors that affect investment and operating costs differently in different communities. Costs for seasonal resorts are also greater. There are sleet and tornado to contend with, too, in some areas.

Nevertheless, the commission report refuses to believe that these differentiating elements, enhanced even by those of competition and tradition, are adequate justification for the great variety of rates reported to it. At least it was "amazed" to find a hamlet of 27 people who had their choice of eleven schedules, another of 248 people who buy their service under sixteen schedules and a company serving 58,000 customers and using 530 different rates for billing them.

As for the extremes of consumption not shown on either of the two charts herewith, Cleveland and Columbus, Ohio, both involved in private-municipal competition, have the lowest rate, $0.60, for 15 kw.-hr. There are 54 cities which charge a dollar or less for this small usage among the large places and 28 among the smaller cities; Tampa ($1.50) and Miami ($1.71) charge the most among the large cities. In the 50,000-100,000 group Cleveland Heights and Lakewood, Ohio, and Holyoke, Mass., charge 60 cents, while York, Pa., comes at the bottom of the list with a charge of $1.66.

In the 500-kw.-hr. usage bracket Tacoma's municipal plant has the low of $6.40 and Yonkers, N. Y., the high of $28.35. There are in the large-city group 49 cities where 500 kw.-hr. can be obtained for less than $12. In the smaller-city group the Springfield, Ill., municipal gives 500 kw.-hr. for $7.30; Mount Vernon and New Rochelle, N. Y., charge the high of $28.81. There are 55 of these cities which charge less than $12 for 500 kw.-hr. Several of the municipals which were near the low for small consumptions are near the high for 500 kw.-hr.

Oklahoma-Kansas Experience

By EARL WHITEHORNE

There has been an argument in the electrical industry for years as to whether or not power companies should retail domestic appliances. Then Oklahoma and Kansas passed laws prohibiting it. Now the Kansas law is repealed. The argument continues with the pros in strong majority. Here are the facts as to what has really happened in these two states in this four years experience in selling only through dealer outlets, with some conclusions prompted by a study on the ground.

FOUR years ago the state legislatures in Oklahoma and Kansas passed their famous law prohibiting utility companies from merchandising domestic appliances. Four years' experience has thus been obtained in promotion through dealers only in a large number of scattered small communities. To find out how it has worked and how everybody is feeling about it, now that the hurt of conflict is all over and time has tested the experiments, I recently visited the territories of the Oklahoma Gas & Electric Company, Public Service Company of Oklahoma and Kansas Gas & Electric Company.

The Oklahoma Gas & Electric system centers in Oklahoma City, a thriving very modern city of 185,000. J. F. Owens, president of the organization, has been a national leader in promoting better public relations. When the law was passed his company adopted a policy of complete co-operation with the merchants. The sales department became a promotional department, reorganized to develop load through the dealers, budgeted for the same expenditure that the company thought it would have made if it had continued active appliance selling. A. A. Brown, sales manager, was in charge. The best of the former sales personnel was selected and given an intensive training in promotion work. Assistance was offered the merchants in all communities to swing into the market in a bigger way and take on the volume that the utility was abandoning.

There was an excellent response. The publicity which the appliance business received while the new law was being agitated made the dealer believe that he was going to fall into a lot of soft and easy business. The company knew that this would not be so. Therefore, it went to work to help the merchants prepare themselves in an adequate manner. It helped the large stores find men to head their electrical departments. Some of them were formerly of the utility staff. It helped to train their salesmen and coached dealer employees in rates, cost of operating appliances, company policies and other electrical knowledge that would help them sell.

By June Brown was convinced that the utility was going to be able to do a better job than when it was merchandising. Owens says he was still skeptical, but became convinced as the work went on. He has seen dozens of merchants become active advertisers of electric appliances where in the past only a few spent money in promotion, and that in a perfunctory way.

FOR TIRED BACKS AND BUDGETS
BUDGET
WASHING and ironing is hard work. No argument there. Here is a simple plan that will save labor, money and time.
The home laundry should include a modern washer and ironer. The housewife, using these two appliances, can finish the family laundry in half the time ordinarily required and save hours over a tub or hot, tiresome labor over an ironing board. The cost to wash and iron an average family laundry is about fifteen cents for electric service.
With a modern ironer you can sit down and take it easy. Your sole part in ironing is to feed the clothes into the ironer. No lifting, pressing or standing for hours. The machine does the ironing, even to dress shirts and pleated skirts.
Your electric dealer will be glad to demonstrate home laundry appliances and explain how little they cost per month in easy payments.
KANSAS GAS AND ELECTRIC COMPANY
Electricity is Cheap
HAVE YOUR ELECTRICAL DEALER EXPLAIN THESE CONVENIENCES

Sample of the type of advertising featured by the Kansas Gas & Electric Company to support the local appliance dealers in their selling

There has also been a great development in public relations due in large part because all the merchants are now speaking well of the company instead of knocking it as a competitor. The utility has not failed to renew a single franchise since that time. Muskogee voted down a municipal plant at the November election.

Dealers are glad the power company is no longer selling appliances. It has removed the strongest single competitor, while continuing that competitor's advertising, in the form of promotion especially designed to help them. Naturally they like it. The company spent $25,000 last year on an air-conditioning program. It goes so far as to pay half the dealer's advertising bill in the case of certain scheduled campaigns and operates a model home for demonstrating appliances. Refrigeration saturation, by the way, is 50 per cent.

Some participating contractors feel that there would be more range wiring if the company were actively building a cooking load. But there is 45-cent natural gas in the area, of about 1,100 B.t.u. content. This is pretty cheap. The local range rate is 3 cents. The company pays for wiring up to $35, which is close to the full cost there. Everybody uses gas for cooking and heating. It is difficult to sell electric ranges here, when the cost comparison is a factor. The domestic rate is 7 cents per kilowatt-hour for the first 8 kw.-hr. per room and 3 cents per kilowatt-hour for the excess. Air conditioning is the coming load. It fits the climate. The company is pushing it hard and has set up an engineering service to aid the dealers, among whom interest is steadily growing.

The most serious criticism of the present set-up comes from the electrical wholesalers, who play a vital part in the appliance business in this sparsely settled country. They used to sell the power company. Now, instead of one customer, they have to seek this volume from many merchants, which is harder. But their main point is that the volume of sales to the smaller communities has fallen off materially since the local office of

the company no longer sells. And of the 220 towns served by this utility, 110 are under 1,000 population. The sales have dwindled outside the large centers. All in all, more appliances would be sold, the wholesalers believe, if the power company were actively merchandising and leading the field with a liberal policy of dealer co-operation. It would be far better for the small electrical dealer, they say, because the department store and mail order houses have taken on the volume that the utility dropped.

But power company records do not bear this out. When selling, it maintained 21 stores outside Oklahoma City. At that time only three makes of electric refrigerators were on sale in the territory. No dealers carried electric ranges. Within a year twelve makes of refrigerators were being actively pushed. Now seven makes of ranges are carried by merchants. Appliances are today on sale in department, hardware, furniture, jewelry, implement, musical, office supply stores, garages, a tailor shop—in fact, stores of all types. Four field salesmen travel the towns outside Oklahoma City, calling on these retailers and taking them merchandising ideas. The number of outlets has greatly increased. Montgomery Ward and Sears, Roebuck have stores in many centers and are getting a lot of the business.

In the end, of course, success or failure for the power company must be written in the growth of load. Its figures for this system show the average total annual domestic revenue as follows:

Year	Kw.-Hr.	Increase	% Increase
1930	458	32	7.5
1931	503	45	9.8
1932	530	27	5.4
1933	554	23	4.5
1934	603	49	8.8

Here again is interesting evidence of progress in the smaller towns. For while Oklahoma City showed an average increase of 45.53 kw.-hr. per domestic meter in 1934, the balance of the territory increased by 52.35 kw.-hr.

There is no dependable comparison between the total appliance sales in the territory before and after Oklahoma Gas & Electric quit merchandising. In its best year, 1929, the company's appliance sales averaged $7.82 per domestic consumer and estimates that it was doing about one-third of the total appliance business. In 1933, the low point of the depression thereabouts, dealer reports showed an aggregate sale of $34.04 per residence connected. In 1934 it averaged $45.28 per consumer.

The comparison of total sales reported by the dealers for the past three years shows an interesting increase, as given in the accompanying table.

In 1933 Oklahoma City had 39 per cent of the total residential meters on the system. In 1930 it provided about 50 per cent of the companies' appliance sales. In 1933 the dealer reports for the entire territory showed the following per cent of total sales in Oklahoma City: Refrigerators 40, radio 37, ranges 39, clothes washers 41, ironers 61, cleaners 37, irons 45, waffle irons 44, toasters 47, percolators 49, table stoves 86, room heaters 44, heat pads 14, food mixers 57 and reflector lamps 71. This would indicate that sales in outlying communities are for the most part about the same proportion.

In a word, Oklahoma Gas & Electric people are highly gratified. They do not want to resume merchandising even if the law was repealed.

In Tulsa the Public Service Company of Oklahoma quit merchandising at the same time, but has not been so well pleased with the result. This system serves 110 towns, and 80 of them have less than 2,500 population. Tulsa has 28,343 domestic consumers and the entire territory 48,835. There is general satisfaction in the fact that the utility is not merchandising and the Tulsa stores have taken on considerable added volume. Some of the former utility salesmen are in charge of store departments and the company is now developing an active co-operation under C. N. Robinson, commercial manager, who has recently taken over the load-building responsibility. There are three contact men working with the dealers and three home service women following up dealer sales.

In 1929 Public Service sold half the refrigerators, all the ranges, all the ironers, half the cleaners and a small share of the clothes washers that went into the territory. In 1930 the volume fell off somewhat, reacting to the impending legislation. In 1931, when the company discontinued, the total

16.83% Increase For The Month

Comparative Statement Electric Refrigerator Sales Compiled From Information Received From Dealers Selling in Oklahoma Gas and Electric Company Served Communities

32.49% Increase For The 5 Months

District	Number of Residential Meters	Month of May: Sales 1934	Sales 1933	Increase	5 Months Period Ending with May: Sales 1934	Sales 1933	Increase 1934	Per Cent of Increase	1934 Sales Per 100 Meters
Oklahoma City	37,453	675	533	142	2,201	1,556	645	41.45	5.88
Enid	7,275	189	137	52	421	332	89	26.81	5.79
Muskogee	7,255	110	148	* 38	422	316	106	33.54	5.82
Shawnee	5,565	146	139	7	472	441	31	7.03	8.48
Ardmore	4,090	153	87	66	333	259	74	2.86	8.14
Sapulpa	3,096	35	43	* 8	89	91	* 2	.22	2.87
El Reno	2,567	41	30	11	126	70	56	80.00	4.91
Norman	2,443	25	25	---	53	54	* 1	* .19	2.17
Ada	2,342	61	22	39	179	64	115	179.68	7.64
Guthrie	2,031	51	97	* 11	110	82	28	34.15	5.42
Seminole	1,965	86	97	* 11	203	220	* 17	* 7.72	10.33
Durant	1,702	49	40	9	124	62	62	100.00	7.29
Drumright	1,651	21	47	* 26	56	105	*49	*46.67	3.39
Bristow	1,340	27	30	* 3	71	57	14	24.56	5.30
Chandler	1,324	6	10	* 4	13	15	* 2	*13.33	.98
Wewoka	1,199	83	86	* 3	216	157	59	37.58	18.01
Sulphur-Tishomingo	1,150	23	7	16	38	16	22	137.50	3.30
Holdenville	1,110	17	14	3	44	29	15	51.72	3.96
Alva	1,039	25	34	* 9	72	66	6	9.09	6.93
Pauls Valley	1,033	20	19	1	62	31	31	100.00	6.00
Shattuck	985	6	7	* 1	30	15	15	100.00	3.05
Poteau-Heavener	961	4	3	1	19	3	16	533.33	1.98
Total	89,576	1,853	1,586	267	5,354	4,041	1,313	32.49	5.98

*Denotes Decrease

Oklahoma Gas & Electric Company reports appliance sales, in totals for the territory, to all dealers monthly

Annual Sales of Appliances—Units

In the Oklahoma Gas & Electric Company Territory

Appliances	Co. Only 1930	All Dealers in Territory 1932	1933	1934
Refrigerators	992	6,397	8,292	11,100
Radios	....	11,242	13,356	19,580
Ranges	118	48	334	139
Clothes washers	2,085	5,487	8,662	11,067
Ironers	193	444	320	438
Cleaners	822	1,406	1,565	4,066
Irons	2,693	14,663	13,769	17,149
Waffle irons	921	4,494	4,773	5,397
Toasters	325	4,122	5,046	5,947
Percolators	487	3,497	3,477	3,313
Table stoves	83	933	977	1,434
Room heaters	126	423	977	919
Heat pads	186	857	498	1,876
Food mixers	11	47	1,304	2,058
Reflector lamps	.....	752	856	6,932

DEALER MERCHANDISE SALES REPORT—AUGUST, 1934

Town		Tulsa			Okmulgee			Henryetta			Hugo			Nowata			Bartlesville			McAlester			Totals	
Total Number Co-operating Dealers	1934	33			13			6			5			8			11			13			145	
	1933	25			12			5			6			8			11			9			102	
No. of Dealers Reporting this Month	1934	29			12			6			5			6			9			13			120	
	1933	24			6			3			3			3			11			9			89	
ELECTRICAL APPLIANCES		Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Avg. Sales Per Dealer	Sales Per 1000 Meters	Total Sales	Sales Per 1000 Meters
Air Condition. Dom.	1934													2	2.0	3.3							2	0
	1933													—	—	—								
Air Condition. Com.	1934																*							
	1933																							
‡Clocks	1934	5	4	2	—	—	—	—	—	—	—	—	—				—	—	—				5	1
	1933	18	1.7	.5	3	4	1.0	2	2.0	2.0	2	1.0	2.7				1	2	3					
	1934	9	1.5	.5																				
‡Toasters	1934	1		26	4	6	1.3	—	—	—				—	—	—	—	—	—	4	6	1.9	11	.2
	1933	88	5.8	3.4	3	4	1.0	2	2.0	2.0				1	2	1.8	3	.5	1.0	2	.6	1.0		
Vacuum Cleaners	1934	151	9.4	5.5	9	1.3	2.9	2	1.0	1.7	1	5	1.3				2	5	6	3	7	1.4	169	3.9
	1933	85	7.7	3.3	4	.5	1.3	—	—	—	2	1.0	2.7				8	1.6	2.6	—	—	—		
‡Waffle Irons	1934	—	—	—	3	5	9	—	—	—				—	—	—	—	—	—	—	—	—	6	1
	1933	45	2.8	1.7	3	4	1.0	2	2.0	2.0				1	2	1.5	9	1.5	2.9	9	3.0	4.3		
Washers	1934	247	14.5	5.5	35	3.9	14.5	15	2.5	14.0	4	2.0	5.3	2	4	3.3	36	6.0	11.2	33	4.7	15.6	393	9.1
	1933	162	14.7	8.3	22	4.4	7.0	3	1.6	4.8	1	.5	1.4	8	1.6	14.2	28	5.4	12.1	20	5.0	9.6		
Water Heaters	1934																			—	—	—	1	.0
	1933																			1	1.0	5		

*Average Sales Per Dealer" represents "Total Sales" divided by the number of dealers handling specified appliance.
*Indicates leader.

‡ Report form changed, majority of dealers not asked to report sales on these appliances

Public Service Company of Oklahoma makes its appliance sales reports to dealers in more detail, showing totals from the principal communities

dealer sales were low, because no effective basis for co-operative promotion had been developed and the manufacturers and wholesalers had not yet built up an adequate new distribution. In 1933 times were better and the trade got into its stride. Many more stores were selling appliances and a large increase in sales resulted, as shown in the accompanying figures, and the gain continued in 1934.

Business is divided here much as in Oklahoma City, with the department and hardware stores and the mail order houses getting the volume. There is a refrigeration saturation in the territory of about 34 per cent, but not more than 1 per cent for ranges. The local domestic rate is 7-6-3 cents, with an average charge of 5.6 cents. The company has a new "full residence service" rate that jumps from $8\frac{1}{3}$ cents for the first 30 kw.-hr. to 4 cents for the next 100 kw.-hr. and then 2 cents, which will carry cooking and 1 cent for water heating off the peak.

Can meet cheap gas

Robinson believes the company can sell ranges and water heating on that rate despite the cheap gas. The average annual domestic consumption has been running up—457 in 1929, 496 in 1930, 524 in 1931, 563 in 1932, 593 in 1933 and 642 in 1934.

The company renewed its franchise recently in Tulsa and signed an agreement that, even though the utility merchandising law should be repealed, the retailing of appliances will not be resumed. The local merchants demanded it and the city exacted it and the company signed it. So the growth of load in Tulsa will have to depend upon co-operative promotion. The company is now selling some ranges and turning the business over to dealers. But everyone agrees—company, wholesalers and manufacturers—that appliance sales have slumped in the small towns. Nobody is selling the idea. And there is pressure on the company to go back to merchandising to test the law.

Because the Kansas law, prohibiting merchandising by utilities, has now been repealed, I went over to Wichita to compare the situation there. The Kansas Gas & Electric Company, an Electric Bond & Share property, when it quit selling appliances, devoted itself energetically to developing a co-operative load-building program. There are 63 small towns in the system and six large ones, with 50,000 residence consumers, 40,000 of them in the six larger communities.

The company did little advertising before the law clamped down on its merchandising activities. The management says frankly that it hardly knew the dealers and did not appreciate their value as creators of market. But it learned through three years of complete dependence upon them. Now that the company is free to sell again it has decided to continue the policy in large part, in so far as the six large towns are concerned—Wichita, Arkansas City, Pittsburgh, El Dorado, Independence and Newton. Here it will sell only ranges and commercial equipment and lamps. It will also sell air conditioning, except in Wichita, where a strong local distribution is providing an adequate service. All other appliances will be sold by the dealers only.

But in the smaller towns the conditions in Kansas have been like those in Oklahoma. With nobody selling the idea by aggressive merchandising the appliance business slumped. Local hardware, general or other stores might carry a refrigerator on display or a clothes washer, but the life was gone out of the business and volume faded. So the company has now resumed active selling of all appliances in all rural communities. But here, too, the co-operative support of the dealers is being ardently continued and the company believes it is the ideal program.

There are 24,335 refrigerators now connected on the system, a saturation of about 50 per cent. There is a range rate that figures $110 for a five-room house, then 20 cents for additional rooms and then $2\frac{3}{4}$ cents per kilowatt-hour.

The average cost of range wiring in Wichita is $25, which is added to the cost of the range in company sales and the dealers do the same. The company has a standard hook-up beyond the meter and main switch. There are two range salesmen in Wichita and one working the five other major towns. There are six home service women on range work and seven home lighting girls. The salesmen are paid a salary and bonus based on both company and dealer sales.

Utility advertising resumed

About 125 dealers are now reporting their appliance sales monthly to the Kansas Gas & Electric Company and they receive back the mass totals. During the period of non-merchandising the company paid half the cost of dealer advertising, if they included a Better-Light emblem and offered a

small down payment on equipment. But the company advertising gradually dwindled, without the incentive of active appliance selling. But in 1934 it swung back into action all along the line.

Now, F. H. McCullough, sales manager, is using a co-operative program in the six bigger towns that is comprehensive and well supported. The company is contributing to the cost of dealer advertising, helping merchants prepare their electrical advertising and carrying on an effective newspaper campaign of its own, designed to create the desire for electrical appliances to be purchased from any dealer. It has a dealer finance plan, a sales training course for dealer salesmen, specialists to help them close difficult sales, home service follow-up on dealer sales, a testing service, home lighting, kitchen styling and other practical co-operation, all supported by a schedule of sales campaigns with a strong backing of newspaper advertising.

Meanwhile, the sale of appliances has shown marked increase. There are no figures on dealer sales prior to 1931, but the accompanying tabulation shows what has happened since then. Mr. McCullough estimates that prior to discontinuing merchandising Kansas Gas & Electric sold 90 per cent of the ranges, 50 per cent of the refrigerators, 50 per cent of the washers, 80 per cent of the ironers, 30 per cent of the cleaners, 40 per cent of the radios and 60 per cent of the small appliances.

Present program popular

The present feeling of the merchants in these Kansas towns is good. There was no particular complaint against the Kansas Gas & Electric Company before the prohibition law was passed, therefore the present policy is generally popular. Perhaps 50 more dealers have come into the territory and the catalog houses and department stores took on the bulk of the business when the power company laid it down. But the present program is helping all merchants who sell appliances and they are for it. The wholesalers are enthusiastic over the resumption of utility merchandising in the small towns, for their sales in the country districts had about died out.

The record of domestic load increase tells the story, however. On the Kansas system the average annual consumption in 1929 was 527. In 1930 it was 554, in 1931 it was 581, but the next two years it only increased to 588 and 591. It was 637 at the end of 1934. And here lies the problem, it seems to me, in Wichita, as well as in Tulsa and Oklahoma City.

Dealer sales held up

The great need of all power companies today is for a quick increase in revenue from domestic customers to help them bear the heavier tax burden that has been piling up and to carry the lower rates that are impending. The question is, can load be built fast enough to meet this need through the activities of dealers alone—assisted though they be? Companies that are actively merchandising can have more salesmen in the field and put heavier pressure on appliances that build load. They can rent ranges and water heaters. They can rent small refrigerators to minimum bill consumers if they want to and speed up the development of the market. But can they force an adequate acceleration when the selling must all be done by independent dealers?

The figures from Oklahoma and Kansas indicate that consumption has continued to increase during the period of dealer selling. These totals have, of course, been considerably influenced during these years by the fact that there has been a loss of many residence customers of the smaller kilowatt-hour class, and this naturally has lifted the average up somewhat. Also, the popularity of refrigeration has been sustained, and this load that the dealers have put upon the lines has brought a material growth in consumption. In the larger cities also—Oklahoma City, Tulsa, Wichita—there are enough dealers so that, with the increased co-operative activity, the load increase is going forward at about the rate that has been considered normal. But this normal rate means maybe ten to fifteen years to double the present figure, and the urgency of the present situation will hardly wait that long.

Ideas are changing fast in the industry right now, under the pressure of events, and sales managers are beginning to think in terms of 1,000 or 1,500 kw.-hr. per year, not some day, but before long. There is no apparent prospect of accomplishing this, however, except through the continued selling of refrigeration and the rapid building of a range, water heater and air-conditioning load. But this the dealer can hardly do—even with the best of co-operation—because he has no money to invest in pioneering. So with full appreciation and no little admiration for the excellent record that has been made, particularly in Oklahoma City, under difficult conditions, I came away wondering.

Commissions for load building

Can any power company hope to make the growth that is now so vital by merely assisting the merchants in their selling? Would it not be safer to develop a more creative co-operation, in which the full strength of the utility organization can be thrown into the building of a market by energetic direct merchandising, with policies that give full equal opportunity to all dealers and a profitable participation in a large opportunity? This may be difficult to do, but still it way be necessary—even to the point of paying dealers a commission for load put on the lines, or some other measure that will return the competitive conflict. To build this greater load, now so vital, the way may have to be found.

Annual Appliance Sales—Units

Public Service Company of Oklahoma Territory

	Utility		Dealers		
	1929	1930	1931	1933	1934
Refrigerators	312	362	199	3,324	4,863
Ranges	116	87	98	6	84
Ironers	309	210	165	239	284
Washers	705	506	347	2,474	3,747
Vacuum cleaners	1,114	788	500	1,188	1,981
Water heaters	8	13	4	2	....

Kansas Gas & Electric Company Territory

	Utility		7 Mo.	5 Mo.		Dealers		Utility
	1929	1930	1931	1931	1932	1933	1934	1934
Ranges	318	255	133	88	111	56	65	85
Refrigerators (dom.)	1,303	856	475	627	2,604	3,563	4,985	74
Ironers	273	225	126	89	270	184	438	2
Washers	1,761	1,282	441	1,007	2,956	3,501	4,828	44
Cleaners	1,204	1,159	582	482	928	1,225	1,488	17
Miscellaneous	9,169	10,448	4,690	8,695	13,759	18,962	22,301	390

One of a Series of Intimate Talks with Industry Executives

Acker on Gas Competition

An Interview by EARL WHITEHORNE

EVER since the gas and electric companies got married there has been a dispute in the family. There was a time when these two were just on their own and each had a tidy little lighting business. Then the Welsbach mantle was invented and began to run the carbon incandescents ragged. Whereupon the "Mazda" lamp was quickly developed and chased the gas lights right out the back door. At which point the bankers stepped in and forced a shotgun wedding and told these two utilities to settle down together and be good.

The gas companies took the cooking business. But twenty years ago the electric range appeared and the argument started. Should combination companies sell electric cooking in competition with their own gas load? Should the banker, interested in both utilities, permit this raid upon his gas investment? The answer has been generally—"No!"

Because of the pressure now on the power companies to reduce rates, cooking and water heating load has become vital. And this being open season for soul searching in the industry, the other day I looked in on E. R. Acker, president of the Central Hudson Gas & Electric Corporation, and put the question up to him. The Central Hudson company serves Poughkeepsie, Newburgh, Kingston, up and down the valley. It is a tight little property that has done a fine operating job and pioneered in load development. I asked him whether he thought that we are headed for the eventual separation of all gas and electric companies as the practical solution for this growing competition or whether it can be worked out in combination?

"We have given a great deal of thought to that question in our company and have, in fact, made a number of studies of the future of the gas and electric business in our territory with that in mind. We can find only one answer. We believe that the relationship between gas and electric service must be ultimately determined in the interest of the customer.

"This may sound trite, but it goes deeper than that. No industry has been able for long to ignore the welfare of its customers and prosper. It would be unfortunate, therefore, if any separation of gas and electric properties should interfere with the balancing of these two services in the interest of the customer, through the introduction of commercial competition under which each service would try to get the business without regard to which might be most economic.

"So it has been our purpose to develop a complete combination utility service for our customers which would reach as large a portion of our market as possible. In one of our major city districts we analyzed the cost of serving our entire gas-cooking and water-heating load by electricity and found that there would be no economic benefit to the customer even with a lower rate for larger consumption. Based on these studies, we recommend to our customers gas for cooking, water heating and house heating and electricity for lighting, refrigeration and other household appliances.

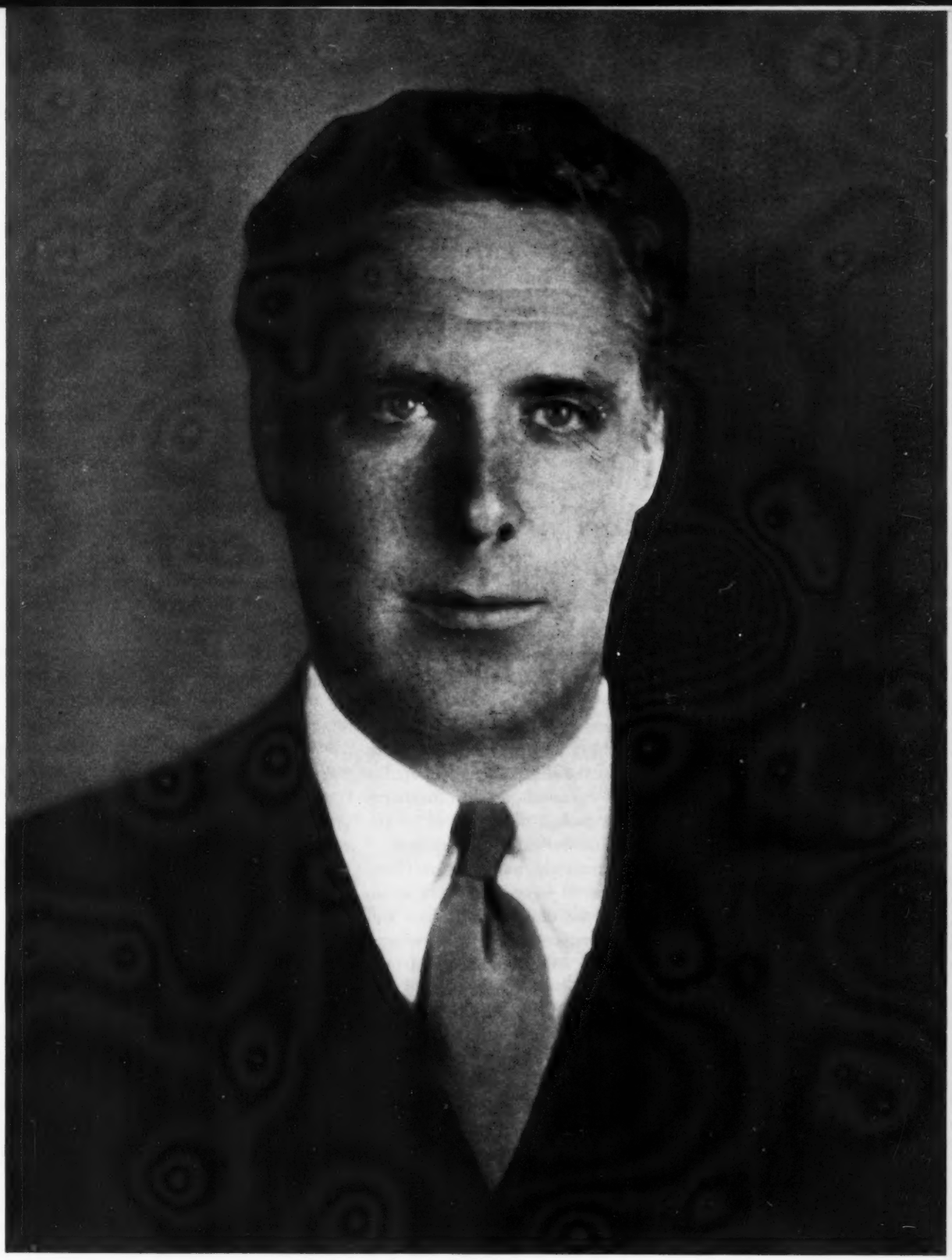
Economic balance sought

"These combination services can be purchased by our customers under our budget billing plan at a flat amount per month subject to adjustment up or down to actual consumption at the end of the year. For complete use of electricity, including refrigeration, cooking and water heating, the customer can purchase his entire requirements at about 2.4 cents per kilowatt-hour. We do not merchandise ourselves, but promote the use of both gas and electric appliances, retailed through dealers, and guide our customers to the most economical combination in each case. This appears to me to be the most practicable arrangement for all concerned.

"We are not gravely concerned over the conflict between gas and electric services. Oil and bottled gas competition is a more serious problem for the gas business in our opinion than the growth of electric cooking. But electric competition is creating great pressure in the gas industry for improvement in appliances and in manufacturing and distribution processes. Great progress is being made which the electric man cannot overlook. He cannot fairly compare *future* electric rates with *present* gas rates. New developments are bound to come, which, in my opinion, will result in reduced rates and preserve the economic balance between the two services."

In the Central Hudson country for years they have been developing both services in parallel. They have brought rates down for both gas and electricity at about the same time and not let either lag behind. They have done this, Mr. Acker says, not just to avoid upsetting the balance, but because they have been steadily improving both services. They do not fight one against the other, but both against the outside competition, and they have taken advantage of every opportunity to increase efficiencies in both departments.

"No, I don't see it," Acker concluded. "To the contrary, I see a close co-ordination of gas and electric service ahead, through the use of electric controls on gas ranges and water heaters, just as we now have on house heaters. I believe that the efficiency and convenience of gas appliances is going to be greatly improved in this way, and that this will bind the two services steadily closer together. The real job for the combination companies is not separation, but the elimination of duplicate expense in serving the customer. And this also argues for joint operation."



ERNEST REYNOLDS ACKER, president Central Hudson Gas & Electric Corporation, the young chief executive of an independent combination property that has developed its service to the home to an advanced degree by co-ordinating gas and electricity in the customers' interest.

ELECTRICAL WORLD

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Rising Standards in Engineering Education

HARVARD UNIVERSITY'S decision to admit hereafter only graduate students to the Engineering School beginning next September marks a significant step in professional education. For many reasons recognition of engineering as a profession has been slow in coming to pass in business and social life. Engineers are a modest lot. In training and practice their work has been so diversified that the sharp focus to popular understanding given such vocations as law, medicine and architecture has often lacked definition as to the underlying qualifications and duties of the engineer.

To the man in the street the engineer has been identified with the operation of locomotives and steam shovels no less than with the design of bridges and administration of power systems. The professional engineer of today is perforce a creative specialist or a profound analyst whose field goes far beyond the purely routine handling of machinery. He is primarily a builder, an expert in methods or a critical investigator seeking to render better service at less cost. No hard and fast line can be drawn between professional and non-professional requirements, unless perhaps the test be that of competence to apply scientific principles to problems of design, production, operation and distribution, but there is a wide zone between the equally honorable tasks of technical artisanship, the "running" of machinery and creative contributions in such fields. The difference is as wide as that between carpentry and architecture.

Engineers are being sought as master specialists in conquering the forces of nature for the larger good of men. Their training must be both broad and deep to serve the needs of a mechanistic age. Public affairs must rely increasingly upon engineering analyses, despite the fact that few engineers make successful politicians. Engineering standards are rising; curricula are being broadened and opportunities increased for graduate work both at technological colleges and in the universities. Such a step as Harvard's emphasizes anew the professional character of engineering on its highest levels.

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Whose Propaganda Is Ethical?

THE serial reports of the Federal Trade Commission on utilities are coming out to resurrect the happenings of the past, to distort them and to use them as a build-up for legislation that will affect the utilities. The entire approach is negative and undoubtedly is used both to undermine public confidence in the utilities and to support the ideas of the commission and those of the enemies of private ownership of utilities. These reports are propaganda and presuppose that this will not be evident to the American people.

Why should the commission not make an affirmative report? The contributions made by the utilities to the advancement of science, to national well-being through the development of the most notable power supply in the world, to the promotion of the use of electricity in home and industry, to the achievement of steadily decreasing costs for service and continued improvements in service—all these make the record of the utilities in public service matters for the greatest possible commendation. Some mistakes have been made, some practices were bad, but these were minor and have been corrected very largely.

The whole truth should be told by the commission instead of using every effort to establish a pretext and justification for an expanded federal power bureaucracy and the passage of detrimental legislation by putting the worst possible interpretation on past happenings. These reports afford added evidence that the utilities themselves must tell their story to the American people.

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Who Will Follow This Suggestion?

MERITORIOUS suggestions are frequently unheeded or never applied until they are repeated or sponsored by the right person. So it has been with the oft-made suggestion that improved highway lighting will reduce the appalling number of night-time traffic accidents and deaths, safely permit increased after-dark utilization of transportation arteries, and thereby bring the same commercial benefits as adding improved highways. Furthermore, highway lighting could share the expense of distributing power to rural sections, and thus expedite electrification there.

Great significance is therefore attached to the suggestion made by Major Philip B. Fleming, Deputy Administrator of Public Works, before a dinner-assembly of men, February 5, when the sodium-vapor highway lighting outside Pompton Lakes, N. J., was inaugurated. He suggested that each state might apply

to its regional director of public works for a federal appropriation to improve its highway lighting. While he declared that such projects might not be considered self-liquidating according to the usual definition, they might be combined with rural electrification projects which are now eligible under the Public Works appropriation act.

Approval of such appropriations would not only lead to realization of the advantages cited, but would stimulate purchase of equipment by utilities and rural prospects and revitalize industries which have been badly depressed and through whose activity re-employment must come.

If appropriations cannot be obtained for improved lighting of all main highways, $55,000 might be secured by each state to install two 10-mile highway lighting demonstrations, as Arthur J. Sweet (Westinghouse) has suggested. These would afford the public better opportunities to judge the requirements for adequate highway lighting and might lead to county or state action, supported by owners of commercial-truck fleets and buses.

Combined development of highway lighting and rural electrification, the door to which has been opened by Major Fleming's suggestion, can materialize if every one who will participate in the benefits gets behind the plan and efforts are co-ordinated. The combined benefits can be made to appeal to the public, which should be prompted to apply for federal appropriations. Utilities, manufacturers of utility and farm electric equipment, fleet and bus operators and many other groups should spread Major Fleming's suggestion.

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Automatization Economics Sounder Than Ever

OF THE two real problems ever presented by automatic station and substation practice, technical and economic, the former was solved some time ago. There has been in existence, in fact, a school of thought of the confirmed opinion that practically anything that a station or substation operator can perform can be performed more quickly, more exactly and more reliably by an automatic device or control circuit. Ample operating experience is available and some of it has been cited to prove the soundness of this thinking.

Economic justification of automatics has not been so well established. But here, too, technological progress has helped. Operating experience has indicated the possibility of simplifying protection schemes; relay development has further helped to bring costs down. Added to this has been the continually increasing cost of attendant labor. As a net result the economics of automatizing stations and substations of all kinds is on a sounder plane than ever. In many cases savings that will return the original investment in from two to four years are possible.

The utility industry is today faced by the burden of increased costs of raw materials, such as fuel and supplies, by increased labor costs and by additional taxes. To survive, it must cut costs. In very few fields are the possibilities for saving as good as in the field of automatization. When coupled to the savings, there is presented an opportunity for improving service. Can the industry waive this opportunity of saving itself?

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New Standards in Power Company Selling

OUT of the past year of stress in the power industry has come a change in the commercial attitude of many utility companies that holds much promise. It strikes at the root of an idea that has hobbled progress for a long time. It is that shortsighted tradition that appliance selling should be considered as apart from load building, that the merchandising operation should show a profit without crediting added revenue from domestic consumers.

Power company sales managers have long been required to show black ink, and thereby their hands were tied. They did not attempt more than a modest merchandising activity. They were restricted to perhaps a 10 per cent increase in average residence consumption in a year. To build up domestic revenue more rapidly would call for an investment in load building, charged against future income, and this was taboo. And such being the custom, the slow growth has been looked upon complacently as a fair performance, and the fact that we were not getting anywhere with the big job of electrifying the American home was lost sight of.

But now, under the pressure of the times, this attitude is changing. Residence rates are being reduced. Commercial effort is being expanded and intensified. The attention of the industry is focussed on appliance selling, not to make a merchandising profit, but to build domestic revenue. And so we see companies renting ranges in order to popularize electric cooking and even renting small refrigerators in order to convert minimum bill customers to a paying basis. And where in times past ten salesmen would be put on for a special load-building campaign, we now see fifty hired, or seventy. And something worth while is accomplished.

It is well—and it is time. The power industry has not yet begun to find out what it can do to build load and revenue. For utility men are now just feeling their way into the bigger selling that lies ahead. It will mean broader policies and more liberal spending—more company selling and more co-operation with dealers, through financing and promotion. It will set new merchandising standards and open the door to a new scale of domestic usage. It will carry lower rates and pay the taxes, too. It will lift the power business to a new prosperity.

Manufacturers After Business

Social insurance, federal housing, code and other topics hold attention at N.E.M.A. meeting in New York — Sections active in code operation

More than 1,000 electrical manufacturers attended the N.E.M.A. meeting held in New York last week. Most of the time was taken up by group or section meetings, but several full meetings were held to discuss outstanding situations.

At the annual luncheon, presided over by President F. C. Jones, the guest of honor was James A. Moffet, who spoke on the Federal Housing Act. An extract of his remarks follows:

Your industry from top to bottom, from manufacturer to retailer, has given the Federal Housing Administration enthusiastic support ever since we began to function. You have given us that support consistently in your trade publications, your advertising, your public meetings, your policies and, best of all, in your daily labors. It is the purpose and the plan of myself and of all my co-workers in Washington and in the field to see to it that in 1935 the electrical industry shall have such a market, in volume and in variety, as it never before imagined.

If the industry is to cash in on all the opportunities in our campaigns, modernization, and electrical goods for modernization, must be sold by the electrical manufacturer, wholesaler and retailer as well as the electrical contractor. They can do it through advertising, through public addresses, by starting or helping along the organization of modernization campaign committees in their communities, and by volunteering for individual work in house-to-house canvasses to secure pledges from home owners to modernize or repair their property.

Urges house-to-house canvass

We have learned from experience in the field that nothing is so effective in promoting modernization as the house-to-house canvass; that nobody is so effective in canvassing as a man who stands to profit directly in his business from the modernization he advocates. That makes electrical manufacturers, retailers and contractors A-1 canvassers. But for this industry to profit by our program it is not necessary that the modernizer of a home plan the job to include one of the permanent or built-in electrical products.

In creating thus far, through actual work and jobs pledged, more than $400,000,000 worth of modernizing and repairing, the Housing Administration has observed that when a man and his wife have their residence all fixed up they want to buy, and do buy, new things. They buy articles for whose purchase money cannot be obtained in a modernization loan. They like to have added conveniences and to replace old articles with new ones. So they are prospects for the makers and sellers of electrical waffle irons, electrical clocks, laundry irons, vibrators, juice extractors, meat grinders, and so on through your long list.

Another matter which I shall merely mention, because you no doubt have long ago seen it, is that the modernization program creates a year-round, unfailing market for the electrical materials used in altering or repairing a residence. In the past such building activities had their seasons, but under the modernization campaign stimulus they are continuous. We have had numerous community reports of the campaign increasing building operations in December, the month which up to this winter had been their dullest of the year in building.

Mortgage insurance benefits cited

We are striving to accelerate the program during the next few months, because the law provides that we cannot insure modernization loans granted after the end of this year. By that time you should be receiving great benefits from the second and permanent part of the national housing program. It is the campaign for new residential construction now being launched under the mutual mortgage insurance plan contained in the Housing Act. Here is a project even greater in scope and richer in profit opportunities than the modernization drive. It can help to create a more stable market for electrical goods, since its purpose is to revivify and make lasting the welfare of that portion of our economic system connected with home building.

The eventual aim of the program is to reform our residential mortgage structure in such a way that credit will always be available; the slumps and booms in construction will be smoothed out, and the normal need for new homes will be met in good and bad times. America requires hundreds of thousands of new homes right now. Five years of slackened construction are behind us. Before us there stretches the prospect of building and equipping the homes needed through a new and inexpensive form of financing.

If this effort meets with success the electrical industry in all its branches should prosper exceedingly. I venture the belief that every part of your industry, whether concerned with capital goods or consumer goods, will enjoy renewed and continual returns. With all my heart I ask you to get behind this plan. It may exceed our fondest hopes as a springboard toward a permanent recovery. It represents a glowing opportunity for your industry, as well as a myriad of other industries, to do more business, on a more regular and lasting basis.

Support for the housing movement was urged by B. W. Kerr, president Railway & Industrial Engineering Company. Unanimous and unselfish support of this movement would aid all branches of the industry and both N.E.M.A. and the utilities should look upon F.H.A. as a major project to support.

Willard L. Thorp, chairman of NRA advisory council, discussed problems of NRA with special consideration of price policy, distribution differentials and the relation of the Administration to industrial self-government. J. S. Tritle, vice-president Westinghouse Electric & Manufacturing Company, gave a history of code development and code operations by N.E.M.A. and expected that the present code amendments would receive action by NRA within 90 days. A representative of the Department of Commerce discussed social insurance for industry and outlined present developments and suggestions. Many section meetings were held to discuss conditions existing in the several product groups. Individual manufacturers were quite optimistic about the business outlook and the entire meeting reflected this atmosphere.

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Utility Assets Highly Overvalued

Federal Trade Commission charges holding companies with $1,463,334,892 write-ups — Insull and Doherty named in market manipulations — Utility executives protest findings.

Assertions that many private utilities arbitrarily inflated their assets $1,463,334,892 through "optimistic judgment" of high-salaried executives and perfunctory "horseback appraisals" by the company engineers were made to the Senate in another report by the Federal Trade Commission. The commission reported these "write-ups" caused increased power rates for the public.

The commission's investigators found: (1) Eighteen top-holding companies with fixed asests of $3,116,207,926 with alleged "write-ups" totaling $273,385,067, or 6.9 per cent; (2) forty-two subholding companies with fixed assets of $2,186,302,222 with alleged "write-ups" of $350,554,482. or 19.1 per cent; (3) ninety-one operating companies with $3,306,893,610 in fixed assets with alleged "write-ups" of $608,918,570, or 22.6 per cent.

Market manipulating charged

Largest "write-ups" by systems reported by the commission included Associated Gas & Electric, $264,140,616; Electric Bond & Share, $263,751,238; Cities Service, $246,515,310; Southeastern Power & Light, $115,519,977, and Middle West Utilities, $107,978,607.

Manipulations to support prices of utility holding company stocks, together

with methods employed to market such securities, were described by the commission in another report. Among the market devices named by the commission were pro rata distribution subscription by individuals and others, sales through investment bankers and dealers, selling and distributing groups, sales through controlled or affiliated sales organizations, customer ownership campaigns and over-the-counter sales. A large part of the report was devoted to the activities of Henry L. Doherty & Company and of the Middle West Utilities Company.

In another installment of its report issued this week the commission described how utility holding companies have collected from operating subsidiaries sums due for federal income tax and then filed consolidated tax returns, appropriating the savings to their own treasuries.

Leaders of the public utility industry attacked the commission for the alleged misleading nature of its report.

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N.E.M.A. Secures Adjustment of Eighty-four Complaints

In its effort to secure compliance with the Electrical Manufacturing Industry Code, the compliance division of National Electrical Manufacturers Association during the last six months of 1934 secured adjustment of 84 complaints. Of the 84 cases disposed of, 13 had been referred to NRA, 29 to NRA state offices and 43 adjusted by the Nema compliance division.

Holding Unit Bills Ask Rigid Control

Wheeler-Rayburn legislation placed before Congress seeks dissolution of utility holding companies by 1940 — Eight restrictive measures outlined for interim — Hearings to be held next week

Drastic control of public utility holding companies, pending their enforced reorganization along less complicated lines and ultimate elimination, was proposed in bills laid before Congress last week. The legislation, among the most sweeping in scope since the New Deal Administration began to operate, was introduced in the Senate by Burton K. Wheeler of Montana and in the House of Representatives by Sam Rayburn of Texas, chairman of the two congressional committees on interstate commerce.

After enumerating the evils and abuses of the holding company which call for control, the Rayburn measure declares its policy to be "to compel the simplification of public-utility holding-company systems and the elimination therefrom of properties not economically and geographically related in operations, and to provide at the end of five years for the abolition of the public-utility holding company."

Under the terms of the bills all holding companies would be required to be registered with the Securities and Exchange Commission, and, after January 1, 1937, could not maintain an investment in any other company or its subsidiary engaging in other than the production, generation, transportation, transmission or distribution of electric energy or gas. After the same date electric utility companies would be prohibited from holding an interest in another company engaged in the production or distribution of gas and a gas company would be barred from holding a direct or indirect interest in an electric company.

The bills would prohibit a company operating exclusively in the United States from having an interest in a foreign country without permission of the S.E.C.

It would be unlawful under the measures for any registered holding company or subsidiary to issue, after April 1, 1936, "a security of such company, to guarantee any security or to exercise any privilege to alter the terms of an outstanding security, except pursuant to a declaration which has become effective under Section 7 of the act."

While the bills contain no definite regulation of rates of operating companies, Mr. Rayburn explained that "jurisdiction is conferred upon the Federal Power Commission to fill all existing gaps in public utility regulations; to co-ordinate existing interstate facilities and secure the contribution of new interstate facilities where necessary; control accounts of interstate operating com-

Utility Executives Assail Holding Act

WE HAVE seen in this morning's newspapers a summary of the proposed bill to destroy public utility holding companies. We have not yet had an opportunity to study the bill itself. The official summary, however, indicates that it is based on the assumption that public utility holding companies perform no useful economic function, that they are not only unnecessary but actively pernicious and solely evil, and that they must not be permitted to live.

To this assumption we do not subscribe. And the facts do not warrant such assumption. We do not believe it is necessary to destroy these companies in order to prevent a recurrence of abuses, many of which have occurred in individual instances and which the greater number of holding companies themselves recognize should be corrected. We stand ready to co-operate to the utmost in the framing of regulatory legislation which will preserve the good which the holding company has done, and will continue to do, and prevent the recurrence of such abuses.

Holding companies have played a very important part in developing American industry in practically every field. In the public utility industry they have made possible the widespread use and benefit of electric service. They have raised billions of dollars invested in public utility plants to provide that service. They have developed and co-ordinated these properties into essential economic service units, generally soundly financed, competently engineered and efficiently operated. They have provided employment for hundreds of thousands of men and women. No single industry can boast of greater achievement.

That the holding company system has been abused in some cases and exploited for no useful purpose by some organizations is admitted, just as there have been, viewed in today's light, mistakes in practically all other lines of endeavor. That additional regulation may be necessary to correct such things and prevent their recurrence is accepted. We advocate such regulation.

But to eliminate holding companies would seriously impair the service of the country's whole utility system and would irreparably damage many sound operating companies which are today dependent on holding company assistance. It would work untold injustice upon those who have honestly invested in both holding and operating company securities.

Let us regulate the holding company, not wantonly destroy it. We shall ask the committees of Congress for an opportunity to submit our case for consideration in the confidence that when fully advised they will see the justice of our cause and that out of the present proposals there shall come sane and constructive legislation.

George N. Tidd, American Gas & Electric
H. H. Porter, Am. Water Works & Elec.
Philip G. Gossler, Columbia Gas & Elec.
W. L. Willkie, Commonwealth & Southern
C. E. Groesbeck, Electric Bond & Share
G. O. Muhlfeld, Stone & Webster, Inc.
J. F. Fogarty, North American
C. O. G. Miller, Pacific Lighting
John J. O'Brien, Standard Gas & Electric
C. S. McCain, United Light & Power

panies, and in general to regulate interstate wholesale electric transmission."

In an outline of the holding company features of his bill, Mr. Rayburn said that, pending their "compulsory dissolution and as inducements to the continual progress of voluntary dissolution during such period," the measure would provide for:

(1) Simplification of unnecessarily complicated holding company structures and the elimination from holding systems of geographically and economically unrelated properties; (2) confinement of holding company investments to public utility activities and the exclusion of all extraneous or speculative ventures; (3) control of future security issues and of future acquisitions to prevent further growth of pyramided structures and economically unsound systems; (4) adequate reports and uniform standardized accounts, which will reveal rather than conceal the financial condition of companies and the nature of all intercorporate relationships; (5) divestment from common control of electric utility properties and interstate gas transmission; divestment from common control of domestic and foreign properties; (6) establishment of the principle that a holding company shall not profit from dealings with its own subsidiaries and that all service, management sales and construction companies serving related operating companies shall be organized on a truly mutual and co-operative basis and shall perform their work at cost; (7) rigid control of intercorporate relations wherever there is an absence of arm's length dealing; (8) effectuation of necessary reorganization of holding companies, under federal administrative control.

Defending the part which holding companies have played in the development of American industry, heads of ten public utility holding companies issued a statement, the text of which appears on page 45.

Hearings on the Rayburn bill will probably begin next week in the House of Representatives, at which time representatives of the holding companies are expected to appear in protest. Utility leaders wired Senator Wheeler and Representative Rayburn, asking that sufficient time be granted to enable the utilities to make proper presentation as to the facts of the situation.

COMING MEETINGS

Michigan Engineering Society—Annual meeting, Hotel Statler, Detroit, Mich., February 22-23. E. L. Brandt, executive secretary, 478 West Alexandrine Avenue, Detroit.

National Fire Protection Association—Electrical Committee, biennial meeting, Electrical Association of New York rooms, 46th Street and Lexington Avenue, New York, March 19-22. V. H. Tousley, secretary, Electrical Committee, 612 North Michigan Avenue, Chicago, Ill.

Electrochemical Society, Inc.—Spring meeting, New Orleans, La., March 21-23. Dr. Colin G. Fink, secretary, Columbia University, New York.

Missouri Association of Public Utilities—Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

T.V.A. Loses Petitions for Dismissal of Suit

Federal Judge William I. Grubb denied this week two motions of the Tennessee Valley Authority for dismissal of an injunction suit brought to block the T.V.A. power program in Alabama. The motions were made as the suit of preferred-stockholders of the Alabama Power Company was resumed after a one-week recess.

Judge Grubb also refused to rule on an application of four north Alabama cities for dissolution of a temporary injunction restraining them from proceeding with efforts to obtain Public Works Administration funds for erecting municipal power systems with which to compete with existing Alabama Power Company facilities. This ruling, the judge said, will not be made until the stockholders' suit against the T.V.A. is disposed of.

James Lawrence Fly, chief of the government counsel, made the unsuccessful motions for dismissal of the suit, charging the plaintiff-stockholders had failed to establish a case.

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First Water Runs Into Boulder Dam

On February 1 the Colorado River for the first time in its history was halted when engineers closed the tunnels that diverted the stream. As dawn broke workmen spaded away the last thread of earth fill around Diversion Tunnel No. 1 on the Nevada side. A trickle of water grew into a healthy stream and washed in to the entrance of this tunnel. Then a 3,000,000-pound steel gate on Tunnel No. 4, on the Arizona side, went down and the river was dammed. The dam has been under construction since 1930. The $385,000,000 project not only provides flood control, but will generate electrical power for the Pacific Southwest. The power development of the project is expected to begin early next year. Eventually 1,800,000 hp. will be developed.

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F. D. Comerford to Head Boston Edison Company

Frank D. Comerford, president of the New England Power Association since 1927, has resigned to become president of the Edison Electric Illuminating Company of Boston, to succeed Walter C. Baylies, who is to be made chairman of the latter's board. Mr. Comerford will continue to be chairman of the Power Association board. Carl S. Herrmann, treasurer of the Power Association, has been elected president of that organization and Harry Hanson, assistant treasurer since 1926, has become treasurer.

EVENTS IN WASHINGTON

Preliminary report covering the Federal Power Commission's national power survey will be submitted to Congress the latter part of next week. Release of regional reports in connection with its rate survey will begin in the near future. The first report will cover rates in New England. Next will come the report on New York, Pennsylvania, Delaware, New Jersey and Maryland. The third report will cover T.V.A. territory and the southeast. Other sections will be covered in periodic subsequent releases.

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The State of Iowa, through its state planning board, has applied to the Federal Power Commission for rights to develop 350 hp. on the Des Moines River at Bonaparte, 38 miles above its mouth. The power is to be used for the operation of state-owned wood-working mills and for experimental work in an area on the lower reaches of the river which is to be devoted to reforestation and used for recreational purposes.

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Hearings on the Empire District Electric Company project on the White River in Arkansas will begin late in March before the Federal Power Commission.

PAUL WOOTON,
Washington Correspondent.

Experimental House Built on Unit Basis

Announcement has been made by the General Electric Company of the formal opening of an experimental house at Nela Park on February 18. This house, which was constructed by former Vice-President Frech, is completely electrical throughout, being fully equipped with devices which help to save labor and enhance the comfort and convenience of living. The additional cost of the electrical features of the house is offset as far as over-all cost is concerned by more modern methods elsewhere in the building.

Mr. Frech hopes to show that houses of this type, organized on the "unit" basis, make possible varying combinations of the same size rooms to produce a number of houses which can be reproduced in the same community without danger of monotony. Cost savings, with this type of planning and construction, will permit the installation of more modern conveniences than are possible in comparable houses of the same cost, Mr. Frech states.

Sodium Vapor Lamps Light Jersey Road

New lighting system dedicated — Possibility of each state securing public works loan for building demonstration highway-lighting installation or combining with rural electrification projects

Inauguration of the sodium-vapor highway lighting just outside Pompton Lakes, N. J., and a demonstration of its effectiveness were the occasions for a dinner tendered to more than 150 guests by that town's Chamber of Commerce February 5. Another novelty of the meeting was the zinc-cadmium-vapor lighting during the dinner, which had a decidedly blue-green glow but nevertheless made most food appear to have a pink color and blue clothing to appear green. These lamps, which had never before been applied commercially, as well as the highway lamps were the development of the Westinghouse Lamp Company. This organization with its sister electric-and-manufacturing company and the Jersey Central Power & Light Company installed the highway lighting to provide a field laboratory for the guidance of all interested in making the use of highways safe and pleasant by night.

Arnold H. Vey, traffic engineer N. J. State Department of Motor Vehicles, called attention to the fact that 96,000 persons lost their lives on highways in the United States during the last three years.

Major Philip B. Fleming, Deputy Administrator of Public Works, suggested that it might be possible to incorporate highway lighting in public works projects, and that each community should consult its regional administrator to ascertain if public works loans could be secured for the purpose. It may be possible, he remarked, to combine highway lighting with rural electrification projects which will qualify under public works appropriations.

Arthur J. Sweet (Westinghouse), who designed the mile of sodium-vapor highway lighting that was later inspected, pointed out that most highway illumination is a compromise, but this installation was made so illuminating engineers will not have to make any apologies. Conforming with engineering opinion, the lamps are mounted 30 ft. above the highway, curves being indicated by placing the lamps nearest the outside of the curve. While a spacing of eight times mounting height is desirable, the lamps were spaced 115 ft. apart to utilize existing poles for supports and alternate lamps are connected to separate circuits to permit comparing the effect of two spacings. Part of the demonstration section is equipped with 4,000-lumen lamps in prismatic reflectors and part with 6,000-lumen lamps in metal reflectors, all adjustable for elevation to permit comparisons.

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Edison Pioneers Meet

A meeting of the Edison Pioneers was held at the Hotel Astor, February 11. President W. S. Barstow presided and short talks were given by Arthur Williams and Dr. A. E. Kennelly. About 160 pioneers and friends were present at the luncheon meeting and renewed old friendships. Mr. Barstow was re-elected president and in his address stated that plans were under way for suitable Edison memorial funds to be obtained next year by the Thomas Alva Edison Foundation during a national Edison memorial week.

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McGraw Award Presented to Leo E. Mayer

In recognition of his contribution to the advancement of the contractor-dealer branch of the electrical industry through his constructive leadership in the development of the electrical construction code and the organizing of self-government within that group, Leo E. Mayer, president of the White City Electric Company of Chicago, has been awarded the James H. McGraw contractor-dealers' medal. The presentation was made on February 13 at a dinner meeting held in Chicago and sponsored by the executive committee of the National Electrical Contractors Association and the Code Authority of the Electrical Contracting Industry.

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Great Britain Prepares for National Convention

Plans for the first national electrical convention ever to be held in Great Britain (ELECTRICAL WORLD, November 10, page 74) are taking more definite form. Announcement has been made that the meeting will be held at Bournemouth, opening on June 3 for a period of five days. The British Electricity Commission and the Central Electricity Board, responsible for the erection of the national grid network, are supporting the convention. Practically every important organization in the industry is co-operating to make this convention a successful event. The preliminary program includes addresses by Sir William Ray of the Electrical Development Association, Lord Hirst of the General Electric Company, Sir John Brooke of the Electricity Commission. A special exposition of electrical equipment is to be opened.

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Arizona Seeks Dismissal of Parker Dam Suit

Replying to the order of the United States Supreme Court directing it to show cause why a restraining order should not be issued preventing it from hampering the construction of Parker Dam on the Colorado River, the State of Arizona on February 4 moved that the bill of complaint filed by the federal government be dismissed. The state maintains that the facts alleged are insufficient to constitute a valid cause of action in equity and that the United States is not the real party in interest, but that the Metropolitan Water District of Southern California, a corporation organized under the laws of the State of California, is the real party in interest.

Night driving without headlights
Long-distance driving vision without glare is obtained with 6,000-lumen sodium-vapor lamps on 115-ft. centers

Carlisle Defends Rate Cut Offer Before Legislative Committee

Willing to cut rate base "with an axe" — Junked equipment left on utility books for rate purposes, committee charges at hearing — P.W.A. allotment made for New York plant

At a resumption of public hearings before the joint legislative committee investigating public utilities in New York State evidence was produced to show that executives of the Consolidated Gas Company ordered kept in the company's capital accounts in 1933 equipment costing $102,000, but then possessing only junk value, to furnish grounds for a high-rate base. The letters, forming the evidence, were introduced while Floyd L. Carlisle, head of the Consolidated system, was on the stand, defending the company's present attitude on rates.

John E. Mack, chief counsel to the joint committee, produced copies of memoranda from Consolidated Gas files showing that Vice-President H. M. Brundage, after the general superintendent of transportation of the company had reported that the batteries of electric vehicles costing $102,069 had outlived their usefulness, reported to John Stilwell and Franklin H. Nickerson, vice-presidents, that "it was felt to be a wiser policy to include them in the rate base and argue for their retention, rather than eliminate them and thereby lose any possible chance of presenting a rate base at the highest amount which can be contended for." Mr. Carlisle said he had never known of the orders and thought they were "stupid."

Mr. Carlisle testified that if taxes in New York were the same as in Washington, $26,000,000 could be cut from the public's light bill on that score alone. Defending the company's conditional offer to cut rates $10,000,000, he continued to contend that the companies need a rate of return high enough to be able to finance new equipment at the rate of $50,000,000 a year. If government operation comes in, the government should first buy up the "honest investments" of private companies, he added.

Mack denounces utility officers

In response to Mr. Carlisle, Mr. Mack charged that the consumers were being "rooked" by the companies and figures were read into the record showing that of the 95 cities in the United States with populations of 100,000 or more, New York was seventy-first on the list. Professing confidence in Mr. Carlisle's sincerity, he stated there were men in his companies who would scuttle the ship behind his back, and the result would be that the companies would be scuttled for the stockholders. In reply, Mr. Carlisle expressed a willingness to cut the company rate base "with an axe," but he said that there had been 25 years of regulation of the companies, during which time the city had not gotten to "first base" in its complaints against company rates, and that if there was any great amount of water in the rate base it should have been discovered by now.

At subsequent hearings testimony was given that the Associated Gas & Electric System contrived to turn dormant property worth $2,271,000 into an asset of one of its up-state operating companies at a valuation of $6,500,000. The cost of the transaction to the consumers was, and still is, $250,000 a year in the form of higher rates, according to the testimony. The committee also heard how the Long Island Lighting Company had spent more than $2,200,000 in its five-year fight against rate reductions in Queens and elsewhere on Long Island, and how the cost of the fight was absorbed in operating expenses and thus borne by the consumer.

Recommendations for utility legislation are to be made by the committee to the state legislature within a few days.

The Consolidated system is willing to pass on to the consumers all of the profits it would receive from the abolition of submetering, William L. Ransom, counsel for the companies, told the Public Service Commission at the hearing on the application of the companies to end submetering in the city. The commission granted the company another adjournment until March 6 of the hearings on its application for increased rates to cover the new utility taxes.

Allotment of $3,780,000 for a federal-owned-and-operated power plant in New York City which would enable the government to make large savings on its electric light and power bill has been announced by Public Works Administrator Harold L. Ickes.

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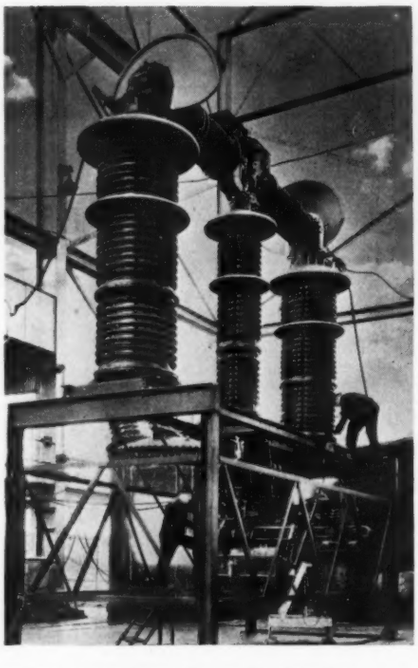
Casper-Alcova Plan Revised

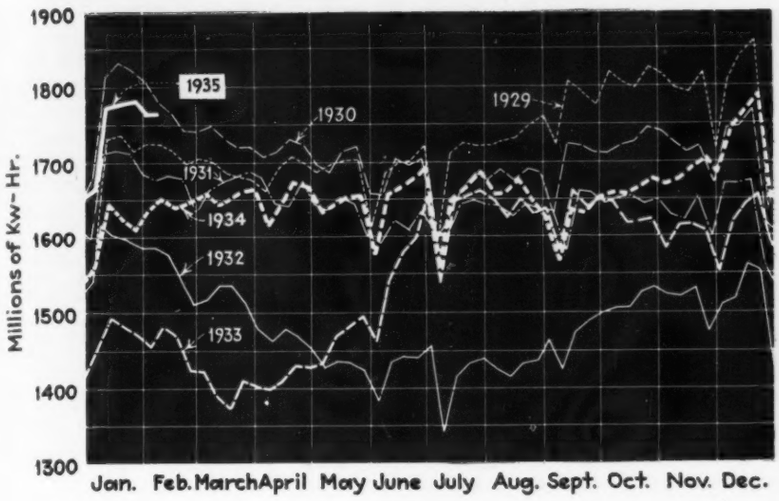
Secretary of the Interior Harold L. Ickes has approved a revised program for construction by the Reclamation Bureau of the Casper-Alcova project in Wyoming. Under the new plans the irrigation development which would have cost $23,701,235 will cost $20,004,254, a net reduction of $3,696,981. A P.W.A. allotment of $12,000,000 has been made to start construction of the project. According to the report made by Dr. Elwood Mead, Commissioner of Reclamation, and approved by Secretary Ickes, profits from the sale of power from the Seminoe Reservoir Power development will not only repay the Seminoe development but will help pay for the irrigation project. The recommendation is made that before construction is resumed certain water right difficulties should be cleared. Through misunderstandings the water rights to be issued by Wyoming for portions of the federal North Platte Project are incomplete.

287-KV. BOULDER DAM BREAKERS TESTED



Impulse oil-circuit breakers, manufactured at Philadelphia, subjected to interruption tests outdoors before shipment. Small view shows condition of contacts after 79 shots. In 53 of these the average current was 4,500 amp., 90 per cent of the rating. Each phase has eight such breaks in series. Test was made at Schenectady.

Output Close to Record Year



Central-station energy output is gradually approaching the records of corresponding periods in the best year of the industry. With 1,763,696,000 kw.-hr. in the week ended February 9 it missed the figure for 1930 by only 1 per cent, surpassed 1929 by 2.2 per cent, 1934 by 6.8 per cent and 1933 by 19 per cent. It rose slightly from the preceding week, which, in turn, showed a recession of but 1 per cent from the January peak.

In view of the seasonal decline in the lighting load the accelerated rise during the last three months of 1934 and the retarded decline since the turn of the year point definitely to an expanding industrial demand.

Regionally the high percentages over 1934 in the Central industrial area deserve notice, especially in view of last year's gains over 1933, which ranged around 15 per cent. The narrowing margin in New England is offset by large gains a year ago.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Feb. 9...1,764	Feb. 10...1,652	Feb. 11...1,483
Feb. 2...1,763	Feb. 3...1,636	Feb. 4...1,455
Jan. 26...1,782	Jan. 27...1,611	Jan. 28...1,470
Jan. 19...1,778	Jan. 20...1,625	Jan. 21...1,484
Jan. 12...1,773	Jan. 13...1,646	Jan. 14...1,495
Jan. 5...1,669	Jan. 6...1,564	Jan. 7...1,426

Per Cent Change from Previous Year

Region	Week ended Feb. 9	Feb. 2	Jan. 26
New England	+ 2.8	+ 5.5	+ 8.0
Middle Atlantic	+ 4.5	+ 6.4	+ 8.6
Central Industrial	+ 8.8	+ 9.5	+14.2
West Central	+ 9.1	+ 8.5	+ 7.4
Southern States	+ 7.9	+ 8.9	+10.3
Rocky Mountain	+15.2	+10.8	+13.6
Pacific Coast	+ 4.7	+ 2.7	+ 6.5
United States	+ 6.8	+ 7.7	+10.6

Out to Sell 1,500,000 Refrigerators

Refrigerator merchandisers have recently been assembled in various districts by the Westinghouse Electric & Manufacturing Company to announce its 1935 line of refrigerators and cooperative plans for the distribution of 1,500,000 units this year. At the first meeting, held in the Pennsylvania Hotel, New York City, January 29, nearly 300 merchandisers were the guests of Westinghouse at a luncheon and a half-day business session. Among topics discussed were appealing features of the new line, distribution plans, total quotas set, advertising and publicity program, dealer sales helps, inducements to salesmen, how dealers can apply the information to getting more profits, opportunities for selling commercial units. Five skits and sound films were very effective in driving home the points made by speakers.

E. B. Ingraham, vice-president Times Appliance Company, exclusive wholesale distributor of Westinghouse refrigerators in the New York district, announced that 1934 sales had indicated that department stores, chain stores and other resale outlets could do the job best, so all specialty dealters in that district had been discontinued January 1, 1935, although a force had been retained for technical selling such as is required on commercial units.

N. L. Myers, eastern manager merchandise department, Westinghouse Electric & Manufacturing Company, reported that the national sales of refrigerators in 1934 amounted to 1,400,000 units and that Westinghouse had sold 40 per cent more than in 1933. With the new line of boxes it expects to sell 1,500,000 in 1935, because it is better organized to help resale outlets do the job.

Features of the new line were discussed by T. J. Newcombe, in charge of refrigerator sales, who called attention to the attractive appearance and declared that there is a unit for every pocketbook, equal in quality and differing only in accessories or refinements that add to appearance or convenience.

A $1,000,000 advertising program and sales aids to dealers were outlined by N. H. Loeber, sales and promotion manager.

Selling of commercial units offers excellent profit opportunities, declared N. L. Myers, because nearly every store, office and public building affords applications. In many businesses electric refrigeration has become a necessity. There will be fewer commercial units installed than domestic units, but their size and the profits will be larger, so commercial sales must not be neglected, he said. Westinghouse will furnish specialists to help close such sales.

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91,000,000,000 Kw.-Hr., 1934

December output of energy for public use was the largest for any month in 1934 and only 0.8 per cent less than in December of 1930. It rose to 8,039,000,000 kw.-hr. from 7,606,000,000 kw.-hr. in November, according to the U. S. Geological Survey. The average daily output increased more than 2 per cent, whereas the normal increase from November to December is 1 per cent. Water power contributed 39 per cent of the total, against 37 per cent a year ago.

The unusual gain in the last month carried the year's production well above previously announced estimates, the preliminary figure being 90,992,000,000 kw.-hr. This is 6.5 per cent more than the output in 1933, less than 1 per cent under 1931 and about 7 per cent below the record of 97,400,000,000 kw.-hr. in 1929.

In all regions operations outstripped those of a year ago, progress being greatest in the East South Central and West North Central divisions. The gradual broadening of the lead over 1933 during recent months is evident from the following table:

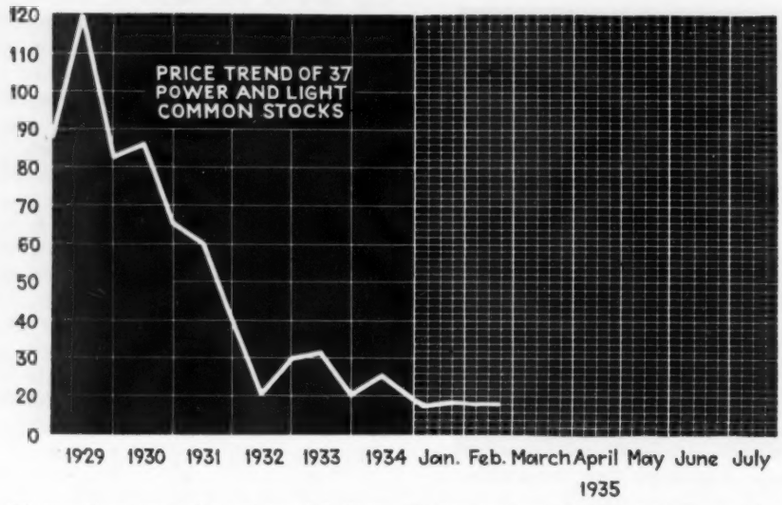
Division	Per Cent Over 1933 Oct.	Nov.	Dec.
New England	—2	+ 2	+ 6
Middle Atlantic	+5	+ 2	+ 4
East No. Central	+6	+ 4	+ 5
West No. Central	+5	+12	+21
South Atlantic	+5	+ 8	+10
East So. Central	+9	+18	+29
West So. Central	+4	+ 7	+ 9
Mountain	+1	+ 6	+ 9
Pacific	+6	+ 4	+ 6
United States	+5	+ 5	+ 8

New York Metal Prices

	Jan. 30, 1935 Cents per Pound	Feb. 13, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.70	3.50
Antimony	14.25	14.25
Nickel ingot	35.00	35.00
Zinc, spot	4.05	4.05
Tin Straits	50.95	50.75
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Utility Stocks Show Slight Change



Uncertainty regarding the gold clause litigation has chilled trading in the securities market. Utility stocks, following the general trend, showed little activity. "Electrical World" index, 18.5 week ended February 2; this week, 18.3.

Winnipeg Utilities to Be Consolidated

Consolidation of all the companies with a reduction of fixed interest on funded debts forms the basis of the plan of reorganization of the Winnipeg Electric group of utilities, which was announced last week by Edward Anderson, president of the Winnipeg Electric Company.

"Under the plan," Mr. Anderson said in part, "Winnipeg Company will take over the assets and liabilities of Manitoba Power Company, Ltd., and Northwestern Power Company, Ltd., and will acquire all outstanding bonds of the Winnipeg, Selkirk & Lake Winnipeg Railroad Company and Suburban Rapid Transit Company, which are wholly controlled by Winnipeg Electric."

Winnipeg Electric would issue $3,500,000 of new first mortgage bonds due in 1960 to refund the bonds due January 2 last, and also $29,275,500 of new general mortgage bonds, series A, and $6,000,000 of series B for exchange for the other present bonds and debenture stock of all the companies. The plan is to be submitted to each committee for approval and thereafter to the holders of the bonds and shares.

•

Allis-Chalmers Orders Increase

Preliminary report of Allis-Chalmers Manufacturing Company for the year 1934, subject to possible adjustment at the completion of the audit, shows a loss of $1,039,406, after all charges, including debenture interest and depreciation, on billings of $20,287,148. This compares with a loss in 1933 of $2,893,905 on billings of $13,286,768. Orders booked by the company in 1934 amounted to $21,875,009, compared with bookings in 1933 of $14,270,941, a gain of 53.3 per cent.

Unfilled orders on the books December 31, 1934, amounted to $8,013,859, compared with $6,425,998 December 31, 1933, an increase of 24.7 per cent. Net current assets as of December 31, 1934, totaled $23,361,978.

•

Columbia Directorate Cut

Action was taken last week by the Columbia Gas & Electric Corporation to simplify the management of its electric and gas properties and to eliminate interlocking directorates and outside financial interests. At a meeting of the board Floyd L. Carlisle, George H. Howard, H. C. McEldowney, William C. Potter and Harold Stanley, representatives of banking and investment interests, resigned as directors and four new directors were elected, resulting in a reduction in the board to nineteen members. The new directors are Edward W. Edwards of Cincinnati, Harry A. Wallace of Charleston, W. Va.; Douglas M. Moffat of New York and John M. Simpson of Pittsburgh.

•

Crocker-Wheeler Cuts Loss

For the year 1934 Crocker-Wheeler Electric Manufacturing Company reports net loss, after depreciation, amortization, interest and other charges, of $47,631, against $123,531 loss in 1933.

•

Electromaster Range Sales Increase 100 per Cent

At the annual stockholders' meeting, held recently in Detroit, R. B. Marshall, president of Electromaster, Inc., announced an increase of more than 100 per cent in sales of electric ranges in 1934. The year's operations were the best in the company's history and resulted in a profit of approximately 31 cents per share of common stock outstanding, after provision for income note interest and estimated federal income taxes. An agreement with Kelvinator Corporation, whereby Electromaster will manufacture a line of Kelvinator electric ranges, was also announced by Mr. Marshall. These ranges will be marketed by Kelvinator.

Current Earnings Reports

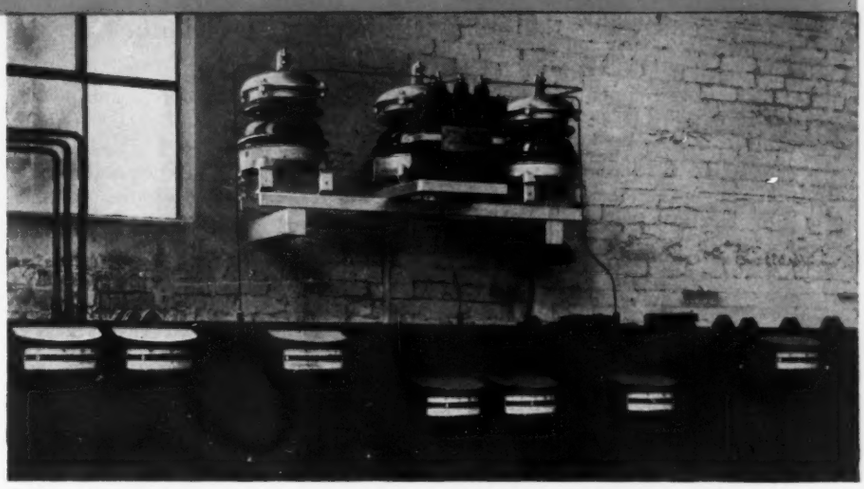
Operating Companies	1934	1933
Alabama Power (Year ended Dec. 31)		
Gross earnings	$15,415,217*	$15,486,234
Net balance	505,105*	933,967
Consol. Gas, Elec. Lt. & Pwr. (Baltimore) (Year ended Dec. 31)		
Gross earnings	28,952,957	27,423,420
Net balance	505,708	345,459
Consumers Power (Year ended Dec. 31)		
Gross earnings	28,644,929*	25,911,452
Net balance	3,022,925*	2,799,377
Detroit Edison (Year ended Dec. 31)		
Gross earnings	45,109,067	41,364,065
Net balance	382,554	1,099,058
Duquesne Light (Year ended Nov. 30)		
Gross earnings	25,371,044	23,993,563
Net balance†	9,841,218	10,868,356
Georgia Power (Year ended Dec. 31)		
Gross earnings	22,098,317*	22,159,789
Net balance	947,813*	2,115,124
Louisville Gas & Elec. (Year ended Nov. 30)		
Gross earnings	9,982,861	9,661,508
Net balance	1,608,434	1,619,239
New Orleans Public Service (Year to Nov. 30)		
Gross earnings	15,034,115	14,849,263
Net balance	193,441‡	115,494
Puget Sound Pwr. & Lt. (Year ended Nov. 30)		
Gross earnings	13,177,279	12,591,680
Net balance	1,551,344‡	1,129,763‡
Virginia Elec. & Pwr. (Year ended Nov. 30)		
Gross earnings	15,095,461	14,671,511
Net balance	1,509,635	1,985,122
Holding Companies		
Commonwealth & Southern & subs. (Year ended Dec. 31)		
Gross earnings	$114,986,769	$108,676,383
Net balance	1,465,911‡	808,489‡
Northern States Pwr. (Del.) & subs. (Year ended Nov. 30)		
Gross earnings	32,072,864	31,104,885
Net balance	5,246,137†	5,958,024†
Philadelphia Co. & subs. (Year ended Nov. 30)		
Gross earnings	47,492,819	45,558,249
Net balance	7,520,982†	7,787,405†
Public Service Corp. of N. J. & subs. (Year ended Dec. 31)		
Gross earnings	120,430,038	116,672,436
Net balance	25,352,951†	26,375,236†

*Preliminary. †Available for all dividends. ‡Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

COMPLETE LIGHTNING PROTECTION ....from the Generator to the Meter

Modern Lightning Protective Equipment for Every Part of the Modern Electric System



Indoor installation of G-E protective capacitor and station-type Thyrite arrester connected to station bus for protection of 2400-volt generators

Protect Your A-c. Rotating Machines

GENERATORS and other rotating machines require a special class of lightning protection—a three-fold protection—to limit surge amplitudes, wave fronts, and reflections within the machine windings.

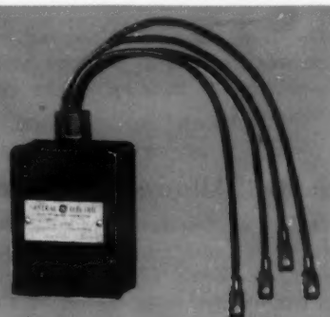
G-E protective capacitors of the Pyranol filled type, in combination with special station-type Thyrite arresters, will provide this complete protection to both major insulation and turn insulation throughout the machine windings.

This modern protection is economical—its cost is insignificant compared with the value of your rotating machines and the importance of their service continuity. For complete information, address the nearest G-E sales office or General Electric, Dept. 6A-201, Schenectady, N. Y.

Station-type Thyrite arresters will protect power transformers and station apparatus

Expulsion protective gaps will prevent lightning flashovers and outages on transmission lines

Distribution arresters will provide virtual immunity from transformer failures, primary-fuse blowing, and service interruptions on distribution systems



Thyrite meter protectors will prevent lightning damage to watthour meters on exposed secondary circuits

330-239

GENERAL ELECTRIC

U.G.I. President Senses Threat to Utility Bonds

In the annual report of the United Gas Improvement Company for 1934, issued last week, John E. Zimmermann, president, replied to an assertion of the Federal Power Commission that the funds of widows and orphans are secure if invested in securities of operating companies and not in stocks or debentures of holding companies or so-called investment trusts. "The inference is," Mr. Zimmermann said, "that while bonds of utility operating companies are sound investments, trustees of other people's money should not invest the funds intrusted to their care in securities of operating companies other than bonds, or in any securities of holding companies.

"The fact remains that they made such investments in stocks of sound operating and holding companies, and properly so, except in cases where restricted to so-called 'legal investments.' Furthermore, bonds of operating companies will not be salable, and will cease to be 'legal investments' if not supported by junior securities, the investment and earnings of which produce a margin of safety for the bonds. . . . "

Stating that this was a "time of general attack on the public utility industry, and particularly against the holding companies," Mr. Zimmermann urged a differentiation between good companies and bad companies.

•

I.E.S. to Award Prize for Bank Lighting

The architectural design of a main banking room with particular emphasis on the lighting has been selected as the problem for the 1935 Illuminating Engineering Society Prize. Regarded as a major project in architectural circles, the award offers cash prizes and scholarships in the Beaux-Arts Institute of Design, where the judgment will be made March 19, 1935. The prizes are administered by the American Institute of Architects.

The Illuminating Engineering Society prize was founded to promote a greater appreciation of lighting in the field of architecture.

•

Camden Allotment Rescinded

Failure of New Jersey to remove legal barriers to Camden's proposal to build a municipal electric light and power system has resulted in rescission by P.W.A. of a $6,000,000 allotment for that purpose. The loan and grant came after the allotment had been held open for a number of months in the hope that the requisite legislation and litigation would be secured to permit construction to start with resultant employment. Progress toward this end has not been reported and the allotment was rescinded in accordance with the previously frequently announced P.W.A. policy of refusing to hold funds which are not employed to fulfill the purposes of the Public Works Administration act.

•

Huge Public Works Program Proposed for Virginia

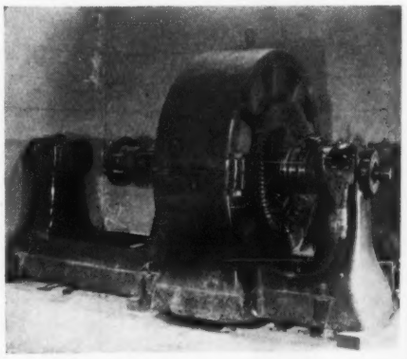
A far-reaching proposal for developing Virginia's water resources and power possibilities heads a $100,000,000 public works program which the state conservation and development commission has recently submitted to Virginia public works administration officials. Wilbur C. Hall, chairman of the commission, said that projects recommended by the commission's water resources and power division were estimated to cost $59,618,405. This total includes $19,997,000 for hydro plants (James River), $39,465,800 for hydro plants (Roanoke River) and $12,000 for study of rural electrification.

New Orders Placed for Electrical Equipment

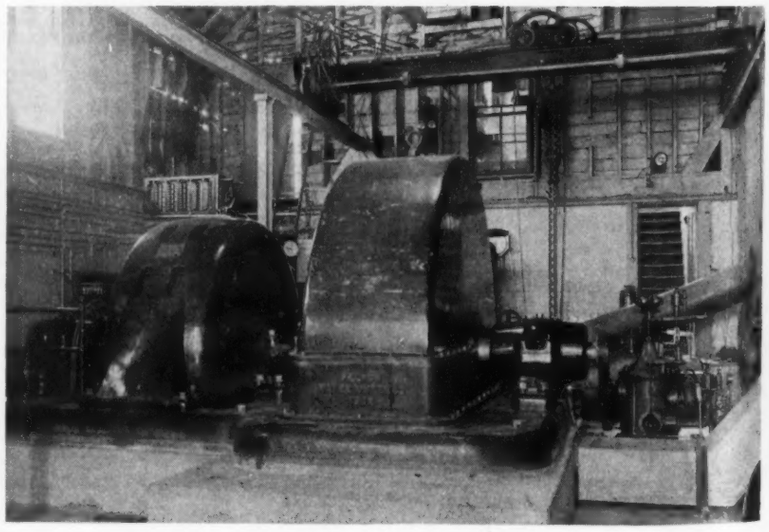
The first important steel mill electrification announced in 1935 includes an award to the Westinghouse Electric & Manufacturing Company for part of the electrical equipment to be installed in the McDonald Works of the Carnegie Steel Company, Youngstown, Ohio. Large direct-current motors totaling 16,000 hp., motor-generator sets and control equipment comprise the bulk of the order. Delivery of the electrical equipment is scheduled to be made within the next few months.

Purchase of $43,636 worth of electrical equipment to be used in connection with tunnel-driving operations on the Colorado River Aqueduct has been approved by the board of directors of the Metropolitan Water District of Southern California. The equipment purchased included 25,000 ft. of armored power cable from the Westinghouse Electric Supply Company for $29,875 and nine transformers from the General Electric Company for $13,761.

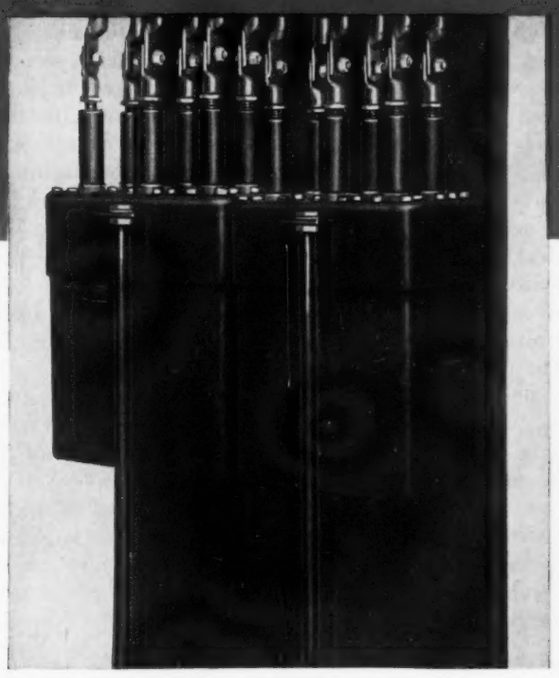
CALIFORNIA EDISON MODERNIZES



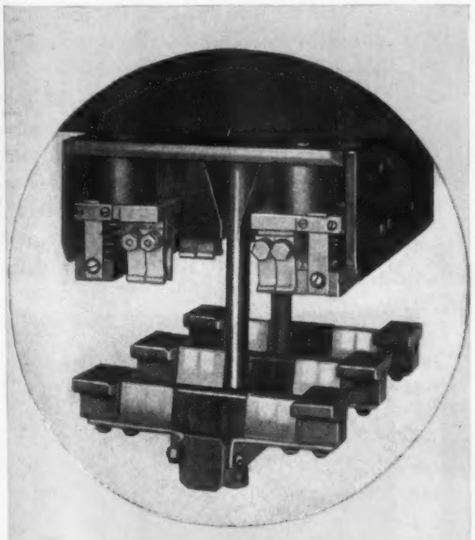
Reconstruction of Mill Creek No. 1 power house of the Southern California Edison Company, started last year, has been completed. The plant modernization program involved the replacing of three old units, having a total capacity of 640 kw., by one new unit of 1,000 kw. capacity. With the installation of the new unit and the necessary new and larger transformer and switching equipment provision has been made for the automatic operation of the plant. One of the replaced units had completed nearly 42 years of service. Its installation heralded the beginning of three-phase hydro-electric power development on long-distance lines in America. The historic generator will be placed on a pedestal in the original power house, about 8 miles from Redlands.



NOW AVAILABLE Oil-blast Breakers for Panel Mounting



GENERAL ELECTRIC INTRODUCES A NEW BREAKER — TYPE FK-43 — WITH IMPORTANT IMPROVEMENTS



Long life without maintenance is assured by extra-heavy contacts of the latest design

★

Universally applicable — fits the job where required to interrupt load every few minutes or where operated only once a year.

Maintenance reduced materially because of the silver-to-silver current-carrying contacts, and solid butt-type interrupting contacts that will stand thousands of operations.

Requires 35% less floor space because of its single tank, and because of the oil-blast principle of interruption, which also increases the reliability of operation.

Any mounting — panels, cubicles, in cells, on pipe framework. Manually or electrically operated.

RATINGS: 600 amp., 15,000 volts, 50,000 kv-a.; 1200 amp., 7500 volts, 50,000 kv-a. Described in Bulletin GEA-2050. General Electric, Schenectady, N. Y.

810-50

GENERAL ELECTRIC

287-Kv. Line Nears Completion

With the towers practically completed and conductor-stringing operations well under way, the world's highest voltage tranmission line will soon be completed by the Los Angeles Bureau of Power and Light. Stringing more than 1,600 conductor-miles of the new 1.4-in. diameter, 287-kv., Hedderheim cable necessary for the two circuits which will bring Boulder Dam power into Los Angeles is accomplished by the method illustrated.

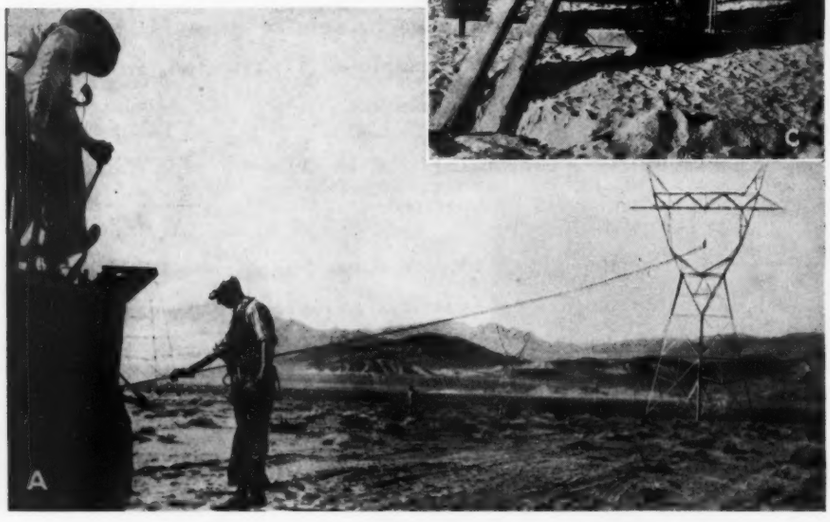
The conductor is delivered to various points along the line on steel drums, each containing approximately 1 mile of cable. These are mounted on a rack equipped with a braking device. Approximately 1 mile farther along the line a tractor, carrying a power-operated drum of steel-messenger cable, is blocked into position. The steel-messenger cable is threaded through the large sheaves mounted on each tower and carried to the position of the conductor.

Each length of cable to be raised is threaded through a special portable braking device which is blocked and guyed in a fixed position approximately 100 ft. in front of the conductor drum. Approximately three turns of conductor are wrapped around this drum. The steel-messenger cable is attached to the end of the conductor by special connectors that protect the end of the cable and easily pass over the large sheaves at each tower.

After these preparations the steel-messenger cable is reeled in, pulling the conductor into its final position on the towers, where it is fastened ready for assembly and attachment of the insulator string. Tension is maintained at the proper value by the operator on the braking device through his telephone communication with the tractor operator, apporximately 1 mile away. After each length of cable is payed out and in position the portable braking device is towed to the next location and the process repeated. This method of stringing conductor has proved very satisfactory and enables the work to proceed with great rapidity.

How 1.4-in. cable is strung

A—Power-operated drum on this tractor reels in messenger cable in accordance with instructions received by operator, who is in telephone communication with the operator on the braking drum shown in C. B—Conductor passes over sheave on tower crossarm. C—Portable braking drum maintains tension during the stringing operation. Reel of conductor in the background.



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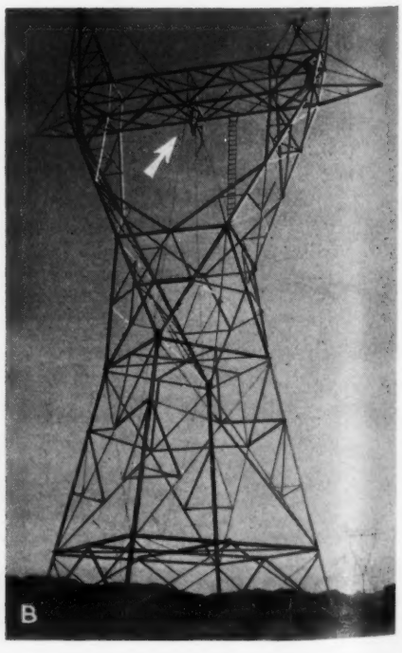
Overcurrent Relay Cut Demand Charge

Rate structures which include a fixed charge per connected horsepower tend to impose a hardship on consumers having large connected loads during periods when business conditions are such that only a small part of the plant can be operated. Realizing this, the Los Angeles Gas & Electric Company co-operated with its consumers in determining ways in which to keep power bills as low as possible.

In one case a large manufacturer of showcases having a total connected load of approximately 800 hp. was operating at about 50 per cent of capacity. He was persuaded to buy a circuit breaker having an overcurrent trip which could be set at the maxi-



This COOLING-TUBE Construction Makes G-E Power-transformer Tanks EASY to INSPECT and MAINTAIN

THE G-E tubular-type tank is unusually strong and durable. Round tubes are welded at each end into short radial headers which are, in turn, welded to the tank. This construction minimizes the number of welded openings in the tank wall.

Cleaning and painting in service are easy because ample distance is provided between adjacent tubes. The tubes are swaged at each end, thus increasing the strength by providing additional thickness at the point of welding. All welds are external, hence they are readily accessible for inspection.

To prove oil tightness, the assembled tubes and headers are tested with gas at a pressure of 80 lb. per square inch.

This cooling-tube construction is just one of many reasons why G-E power transformers stand up in service. Every detail of material and workmanship contributes to one end — the most reliable transformer that can be built.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

310-3

GENERAL ELECTRIC

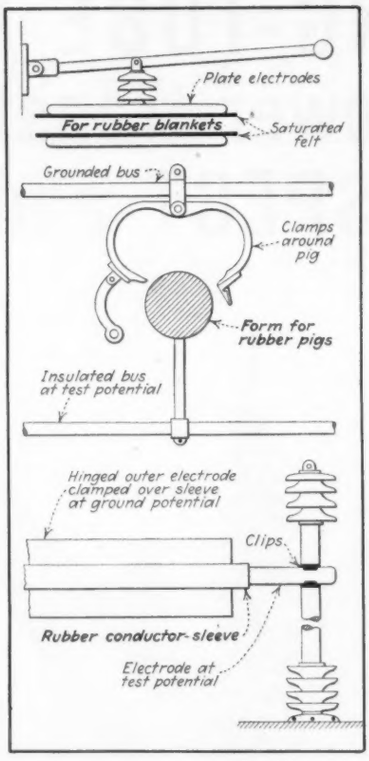
mum required by current operations. The overcurrent relay was set to trip the breaker at 500 hp. and the customer was billed on that basis rather than his total connected load of 800 hp., since he was prevented from using more than the former figure. Recently improved business conditions raised the power requirements of the customer so that the breaker began to trip out frequently and he called in immediately and asked that unrestricted service be restored. The arrangement proved very satisfactory to both parties, the consumer enjoying appreciable savings in energy charges during the period of restricted output and the power company retaining both the load and the good will of the consumer.

•

Testing Rubber Pigs, Blankets, Sleeves

Prevention of potential concentration and corona discharge or electronic bombardment is essential in testing rubber blankets, pigs and conductor shields. Ways of avoiding these conditions, which are employed by one company, are illustrated.

For example, the plate electrodes used in testing rubber blankets not only have rounded edges but are faced with felt which is saturated with water before each test. Metallic core-type and external clamp-type electrodes that conform accurately with the contour of the rubber pigs reduce the possibility of air gaps that might lead to electronic bombardment of the pigs under test. Split-rubber conductor shields are slipped over brass-rod electrodes of the same inside diameter and the outer electrodes, accurately finished to the outside diameter, are hinged and clamped around the rubber sleeves.



Test precautions to avoid unnecessary stressing of electrical rubber goods

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Preventing Bulge of Joint Sleeves

Ever since performance of cables has been greatly improved operating troubles have shifted to the weakest link now existing. This seems to be the cable joints, especially where oil-impregnated cables are used. When the cables are loaded up to rating the oil expands and stretches the joint sleeves because they are necessarily of larger diameter and thinner material than the cable sheath. The sleeves never recover their original shape when the loading and oil pressure drop and gas pockets are formed that induce ionization. Bulging of the joint sleeves is accentuated where the profile of the cable run adds a static oil head to the pressure head.

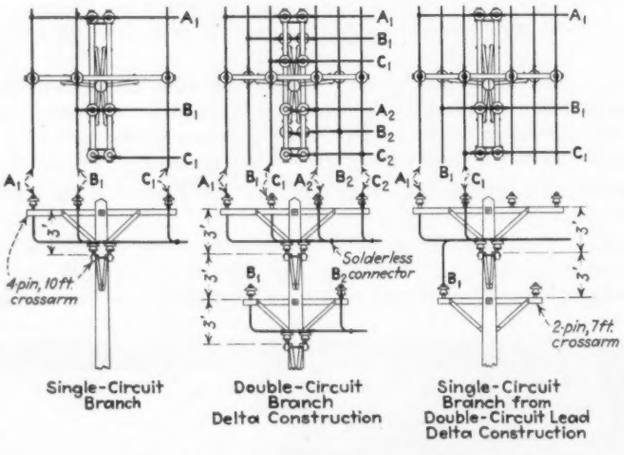
To avoid this distortion and consequent results, one company has tried various remedies: (1) Binding with wire; (2) wrapping with wire mesh clamped in position; (3) inclosing in sheet-metal clamps; and (4) banding the sleeve.

Due to the dissimilar metals used, all remedies caused corrosion. Besides method (1) tended to cut the sleeve as it was subjected to increased oil pressure; (2) was difficult to clamp and expensive; (3) was expensive. Except for corrosion, method (4) seemed to serve the purpose more satisfactorily than other methods.

Coating with asphalt before and after banding might prevent corrosion, but this company favors using lead-covered banding tape. Even with this there is the possibility of the lead crystallizing while the tape is being transported in construction trucks, exposing dissimilar metals to electrolytic corrosion. But so far it seems one of the best solutions, as it is not practicable to increase the thickness of joint sleeves or use stronger metals, as even the tin in the "wipe" or contact of bonding wires on lead sheaths cause corrosion.

Branch Circuits Off Single Poles

Tapping off from a main line is being done in a multitude of different ways, some good and some better, some bad and some worse, some neat and some ugly. In the case of a single pole it is particularly easy to make a messy job, and linemen are often tempted to use extra poles when the job can be done much better on the single pole. How careful designing and standardizing can bring about good construction methods is illustrated in the accompanying standard instructions of the West Penn Power Company. The types of construction look so simple as to be self-evident. And yet every one is familiar with the many unnecessarily complicated methods that can be seen in many places.



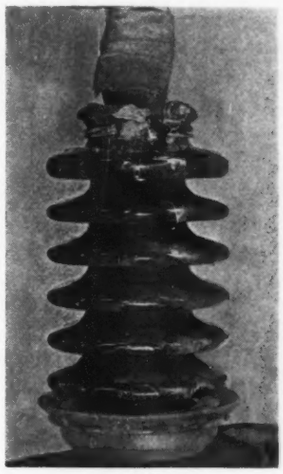
Three ways of making branch taps

WATCH FOR THE LINE POST ADVERTISEMENT IN THE NEXT ISSUE OF "ELECTRICAL WORLD"

LAUGH AT ARCOVERS ON THE

LAPP

LINE POST



SEE BELOW

- Fog type for dirt conditions
- No radio interference
- No punctures or cracking
- Withstands power arcover
- Resists stones and bullets
- Vacuum process porcelain

THE short sturdy flanges on the Line Post keep the arc away from the body and protect it from damage under power arcover conditions. They themselves will not crack except under severe attack.

But if one or more do break off, only a small part of the electrical value of the insulator is lost. Usually there is no reduction in flashover distance and only a small percentage loss of leakage distance. The Insulator can be relied upon to maintain service and usually need not be changed.

If you have a line or a few structures where lightning makes itself too welcome, try some Line Posts. You will be surprised at their ability to "take it."

► DESCRIPTION OF TEST ◄

The photograph above shows the results of a 2000 ampere arcover on a 35 KV Lapp Line Post. It was held for 40 cycles. The test was deliberately made much more severe than would be encountered in normal service by having the current leads axial with the insulator, the magnetic effect thus driving the arc into the unit instead of forcing it away as in service. Some 15 units were tested at currents up to 5100 amperes and all would have maintained service indefinitely.

LAPP INSULATOR CO. INC — LAPP INSULATORS — LE ROY - N.Y. - U.S.A.

Two Floodlights Replace 12 Lamps

By R. J. CORFIELD
Assistant Electrical Engineer
Utah Copper Company, Garfield

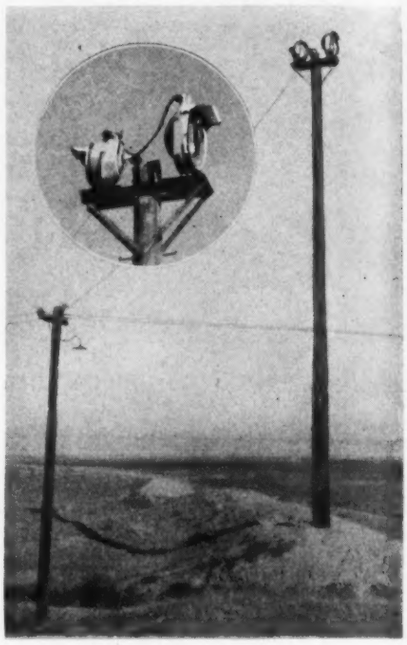
In modernizing our general lighting system an unusual problem was presented in the lighting of a pathway approximately 6 ft. wide and 2,000 ft. long. The original system consisted of twelve 14-in. reflectors, each containing a 200-watt lamp mounted 25 ft. above ground on a conduit "gooseneck," with a pole spacing of approximately 165 ft. The annual cost on this system was $300, distributed as follows:

300—200-watt lamps	$156.00
3—Reflectors	10.50
Labor, changing lamps, etc.	72.50
Energy charge	61.00
Total	$300.00

This pole line was in poor condition and repairs estimated at $75 were necessary. In order to avoid this expenditure for an inadequate system it was decided to apply this amount toward modernizing. Calculation showed that two floodlights would be required to do an equivalent floodlighting job. Due to the somewhat meandering course of the path, one end required a narrow beam with rather long projection, whereas the opposite end required a wide beam with shorter projection. Final calculation resulted in the purchase of one 24-in. 10-deg. floodlight having an angle of tilt of 3 deg., a projection of 1,015 ft. and a maximum beam width of 105 ft. and one 14-in., 32-deg. floodlight having an angle of tilt of 4 deg., a projection of 820 ft. and a beam width of 172 ft.

The territory to be floodlighted was on a slope, going from elevation 100 deg. at one end to elevation 132 deg. at the floodlight support, then to elevation 126 deg. at the other end. Allowance was made in the coverage calculation to compensate for these slopes.

To illuminate properly the dark spot at the point of floodlight support visors were installed on both floodlights. Cost of floodlights, pole, platform and wiring was $245. This installation has been in service one year and the total cost has been the replacing of one 1,000-watt lamp at a cost of $7. Energy cost was reduced from $72.50 to $48, or a saving of $24.50 per year.



Floodlighting cuts path illumination cost by one-third

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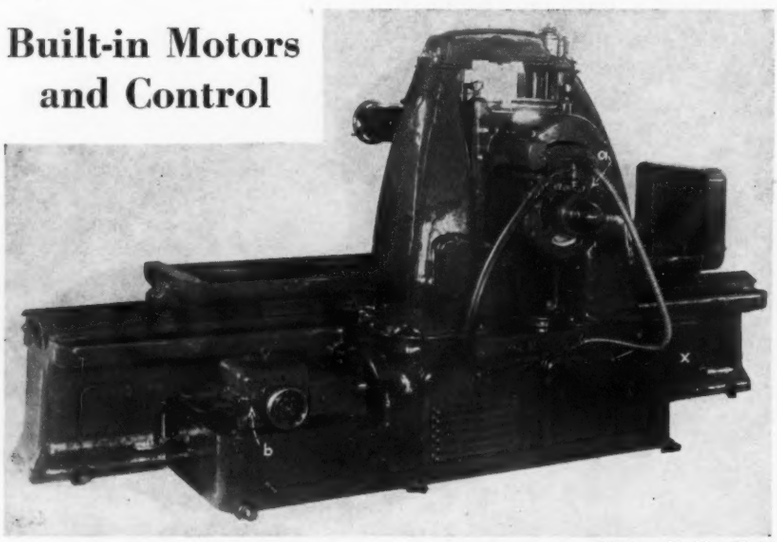
Built-in Motors and Control



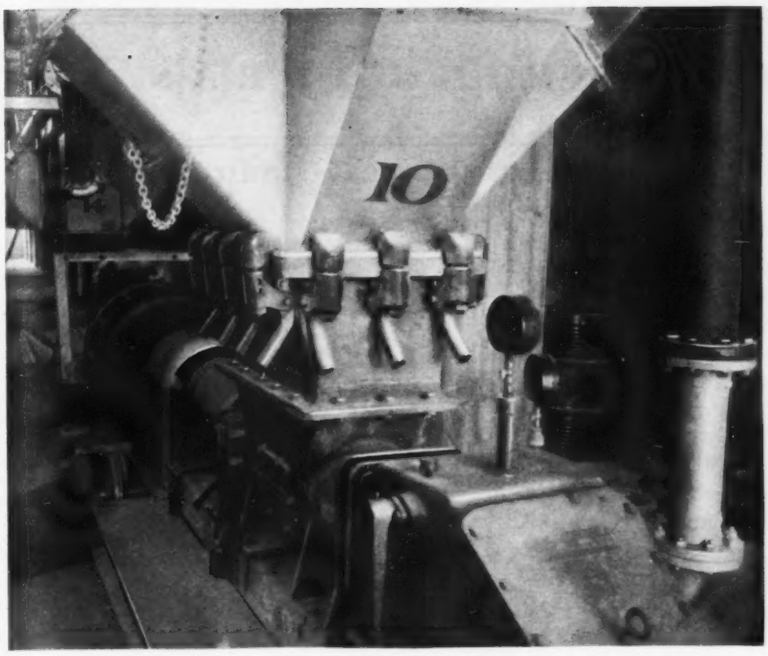
Mattison Machine Works

Three built-in motors operate this 16x72-in. high-powered precision surface grinder—(a) a 25-hp., 1,200-r.p.m. unit directly connected on spindle; (b) a 7½-hp., 1,200-r.p.m. motor directly coupled to the Oilgear pump driving the table travel and feed; (c) a ¾-hp., 900-r.p.m. unit hoisting and lowering the wheel slide. Control for all three motors is in the base which has easily removable covers. These and the opening (x) make all electrical parts readily accessible for inspection or repair. This grinder is installed in the plant of a large automotive manufacturing concern.

Portable Unloader Saves Investment

In equipping its new plants with compressed-air conveying equipment for handling bulk cement, the Santa Cruz Portland Cement Company, San Francisco, Calif., developed a portable discharging equipment. It consists of a car with a motor-driven, dry-cement pump and moves along a track directly below the hoppers of the cement storage bins, where it can be clamped into position. The cement pump is of the screw type, driven by a 50-hp. induction motor. The control equipment is mounted with the motor.

Cement is discharged from the hop-



Motor-driven dry-cement pump in car eliminates complicated air-conveyor system

per into the pump, which conveys it to an air chamber, where air under 60 lb. per square inch picks it up and blows it through 12-in. pipes to the distributing plant hoppers. Power is supplied to the car through a flexible three-conductor cable, flexible pipes also being supplied for the compressed air intake and the discharge ducts. The portable equipment eliminates the need for a complicated piping system from each of the storage bins to the distributing plant and its application suggests that similar equipment might be practical for transporting other bulk products.

Shoe-Drying Racks Electric Heated

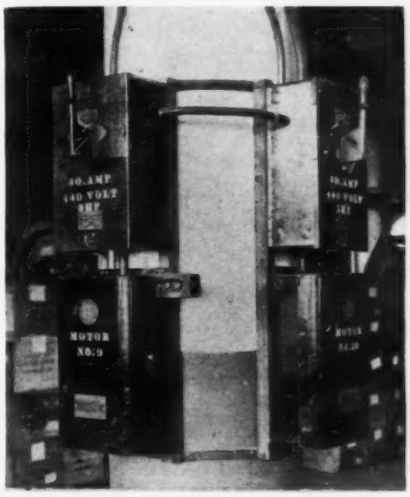
Four 250-watt, 24-in. electric strip heaters replace steam coils as the source of heat for shoe-drying racks in the plant of a nationally known shoe manufacturer. Drying is essential so the shoes can be satisfactorily buffed without tearing. An intense heat that will dry out all of the leather is not wanted.

It was not so much that the steam was unsatisfactory, but it was found that by swinging over to the use of electric heat it was possible to shut down one of the plant's steam boilers during the summer months. This represented quite a substantial saving, because the only other reason for operating the steam boiler was to heat up one or two relatively small jobs which could also be converted to electric heat. The use of electricity has worked out so satisfactorily in these drying racks that the shoe company has never gone back to the use of steam.

Heaters were placed in the bottom of the 14x48-in. shoe trays and a 1½-in. mesh screen placed about 1 in. or so above them so that the shoes placed on the screen are not directly in contact with the heaters. The heaters have been wired so that on medium heat only two heaters are connected, yet they give proper distribution of the heat.

Electric shoe-drying racks shut down boilers in summer

Post-Mount Control Saves Space



Utilizing otherwise valueless space and at the same time providing an accessible and flexible distribution system, the Los Angeles Can Corporation, Los Angeles, Calif., mounts disconnecting switches and motor starters on columns throughout its plant, as shown in the accompanying illustration. The strap and channel iron frame supporting the control units is bolted around the circular column, the entire assembly being easily removable should plant alterations make motor changes necessary. Interesting, also, is the legible description of each motor circuit stenciled on the control cabinet. Easily identifiable circuits greatly simplify maintenance and minimize the duration of outages.

High-Voltage Test Table Made Portable

By W. S. JENNENS
Electrical Engineer,
Ohio Brass Company, Barberton, Ohio

All test operations at normal frequency in our laboratory can be remotely controlled from a portable test table. One operator can control them and take and record all data. Safety is promoted and testing expedited. Any voltage, rate of voltage increase or decrease within the limits of the testing transformer can be readily obtained by making the proper setting on the control table.

Portable control table moved to test location in high-voltage laboratory

Two d.c. and two a.c. meters located on the back panel indicate:

1. D.c. voltage of the alternator exciter.
2. D.c. current in the alternator field circuit.
3. A.c. voltage on transformer primary (or alternator voltage).
4. A.c. current input to primary of the transformer

The table is mounted on wheels and is connected to the switchboard by a 34-conductor flexible cable.

The alternator field rheostat, which is located on the main laboratory switchboard, is motor operated. Two motors, which may be selectively connected to the rheostat by magnetic clutches, are used. A. d.c. motor is used where variable speeds are desired and a synchronous motor provides a fixed rate of change.

Rheostat motors are controlled by an eight-point control drum switch and a small variable resistor on the control table. By means of this controller, the a.c. test voltage may be increased or decreased at varying rates, may be held at any desired value or, by setting the switch at one point, the voltage is automatically raised 40,000 volts per minute (the rate of increase prescribed in A.I.E.E. standards No. 41). A synchronous clock, also mounted on the back panel, may be used to check the rate of increase or decrease or for timing holding voltages. In addition a series of contacts on the field rheostat shaft make and break a small telltale lamp circuit. The flashing of the lamp indicates the speed of rotation of the rheostat and thus the voltage changes.

Current taps of a CO relay are brought to an eight-point switch on the control table. Thus the relay can be easily and quickly set to trip for various current values immediately after flashover.

In addition an emergency trip switch is included on the table. A trip switch is also placed at the maximum position of the rheostat and, as an additional safeguard, a limit switch opens the motor circuit if the trip switch should fail to function. When the trip relay operates it is held until all operations return to zero, when it drops off. A multi-contact relay automatically reverses the d.c. motor and brings all apparatus back to the zero position.

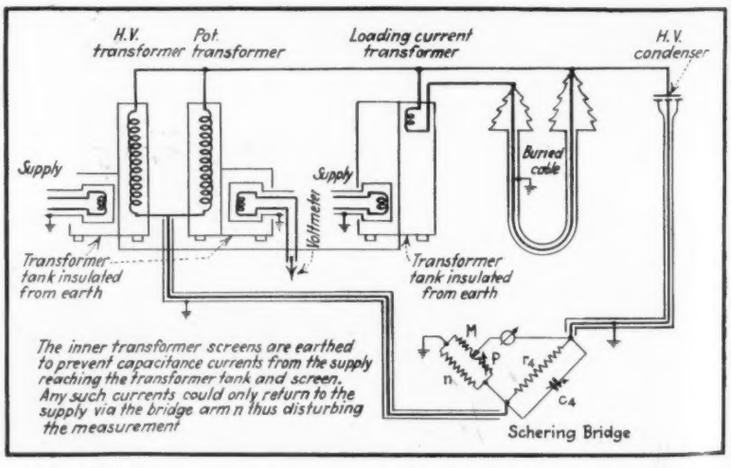
There are three switchboard type indicating lamps in addition to the flashing lamp. A white light indicates that the master switch, which controls all circuits, is closed. A green lamp is lighted when the transformer switch is open. When the transformer switch is closed the green lamp is extinguished and a red light tells that the transformer is in the circuit.

•

Electrostatic Screens Economize Readings

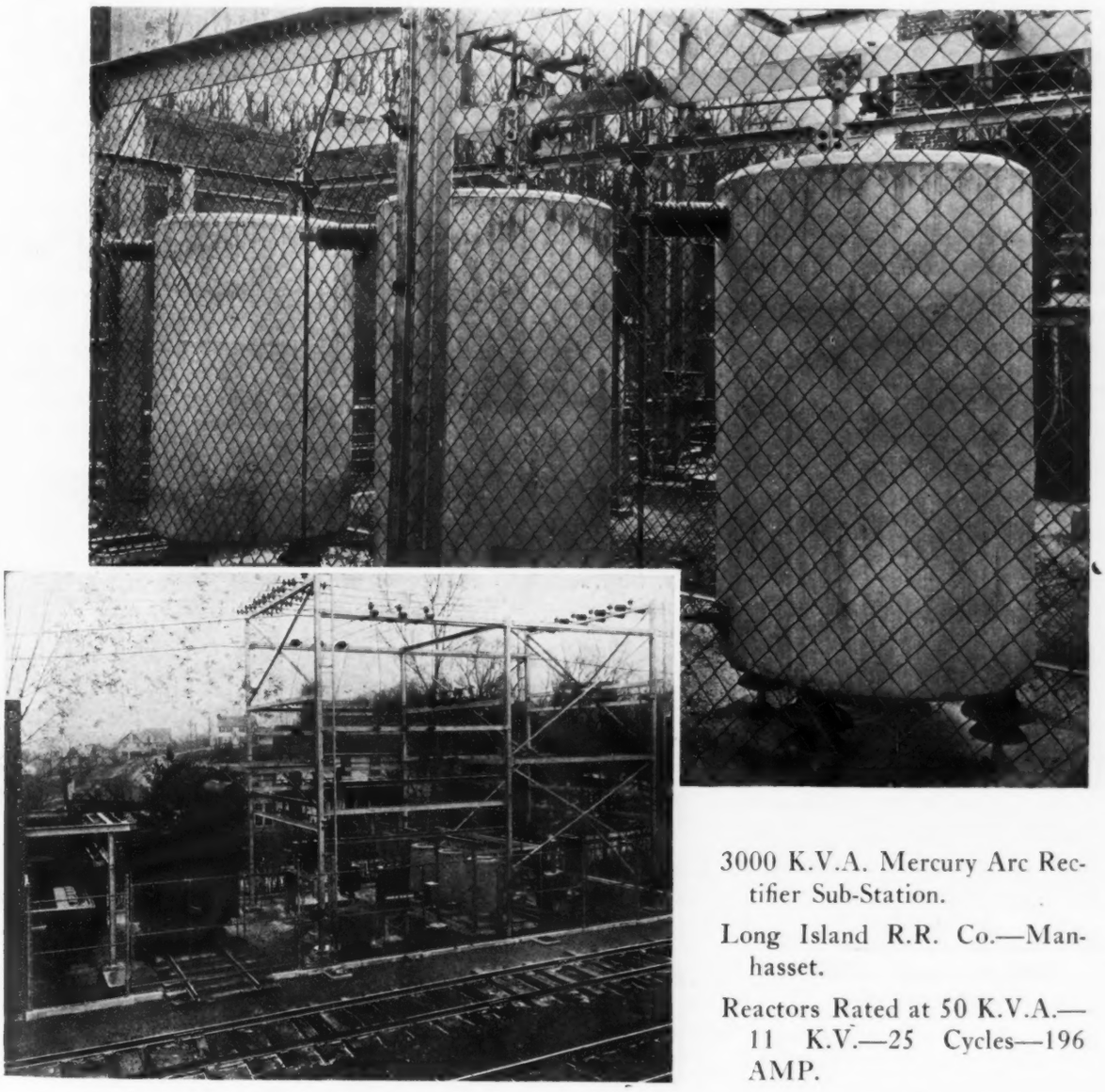
Two electrostatic screens have been placed between primary and secondary windings in all five major transformers in the new research laboratory of Callender's Cable & Construction Company, Ltd., in London, as used in life testing of cables. This applies to the 1,000-kva., 170-kv. and 500-kva., 85-kv. transformers in the high-tension group, to the 170,000/110-volt potential transformer and to the two 750-amp., 76-volt transformers used to superimpose loading current during the heat cycle tests. The last two have their secondary windings insulated for 170 kv.

These double screens make accurate dielectric loss angle measurements possible on buried cables with sheath grounded. In addition to affording this greater accuracy the screens per-


H.V. transformer
Pot. transformer
Loading current transformer
H.V. condenser
Supply
Supply
Voltmeter
Buried cable
Transformer tank insulated from earth
Transformer tank insulated from earth
The inner transformer screens are earthed to prevent capacitance currents from the supply reaching the transformer tank and screen. Any such currents could only return to the supply via the bridge arm n thus disturbing the measurement
M
D
n
C4
Schering Bridge

Double shields between transformer windings eliminate some test readings

RAILROAD SUB-STATION
protected by
MURRAY LOW LOSS REACTORS



3000 K.V.A. Mercury Arc Rectifier Sub-Station.

Long Island R.R. Co.—Manhasset.

Reactors Rated at 50 K.V.A.—11 K.V.—25 Cycles—196 AMP.

Murray Outdoor dry type reactors consist of concentric stranded, enameled and insulated conductors imbedded in concrete. They are supplied for operating voltages up to 33 K.V.

Highest all-year efficiencies. Highest Short Circuit Protection. Lowest Temperature Rises.

When in need of reactor protection, send us your inquiries.

METROPOLITAN DEVICE CORPORATION
BROOKLYN, NEW YORK

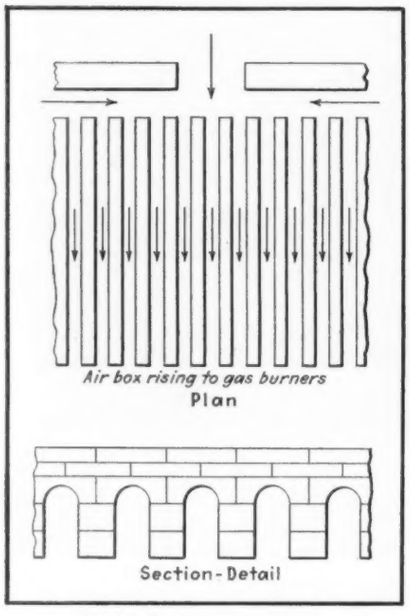
mit measurement on buried cables without making preliminary determination of the losses in transformers and leads or the subsequent vectorial subtraction. The insertion of the electrostatic shields thus halves the number of readings to be taken.

•

Air-Cooled Furnace Floor

By R. A. FARIS
Superintendent
Mountain States Power Company,
Casper, Wyo.

One of the gas-fired boilers used to supply steam for the district heating system operated by the Mountain States Power Company in Casper, Wyo., had to be rebuilt. In a large pile of salvaged fire brick and other refractories was a considerable amount of baffle tile whose shape suggested the idea that it could be used to improve furnace efficiency.



Baffle-tile tunnels preheat combustion air

The boiler foundation was lowered about 27 in., leaving that much space below the bottom of the boiler. This space was filled by a new furnace floor which rested on a series of 22 parallel tunnels running from back to front of the boiler and whose top arches were formed by the salvaged baffle tile. Air flows into these tunnels from three openings at the back and through them to an air box at the front of the boiler inclosing the gas burners. The combustion air thus is drawn under the furnace and is preheated. No special test has been made to determine the definite improvement in boiler efficiency resulting from this air-cooled furnace wall. Such a test would be almost impossible to make on account of the difficulty of separating the effect of this particular thing from the other changes incorporated in the rebuilding job. But, at the least, the air tunnels reduced the pile of salvaged refractories in the yard and the present performance of the boiler gives ground for believing that the accomplishment was very considerably more than just that, as the foundations are protected from excessive heat and combustion air now enters the boiler through the gas burners at about 138 deg. F.

•

Resistivity Measured to Locate Water

Search for water-bearing strata instituted by the Emergency Relief Committee in meeting the drought situation in the Midwestern states last summer was speeded by a scheme developed by O. H. Gish and W. J. Rooney of the Carnegie Institute at Washington.

The scheme was based upon the variation of resistance of the earth, at various depths, due to the presence of moisture. Earth resistivity varies from a few hundred ohms, per centimeter-cube, to a thousand ohms or more for clay, and several thousand ohms for rocks in place. However, in each case the presence of water materially reduces the resistance.

By this method of resistance measurement, current is introduced into the earth through two terminal electrodes separated by a distance from a few feet to several hundred feet. The current will take an infinite number of paths through the earth, the intensity in each path being inversely proportional to the resistance of the path. Potential drop along this path is measured between two pick-up electrodes spaced equally between the terminal electrodes.

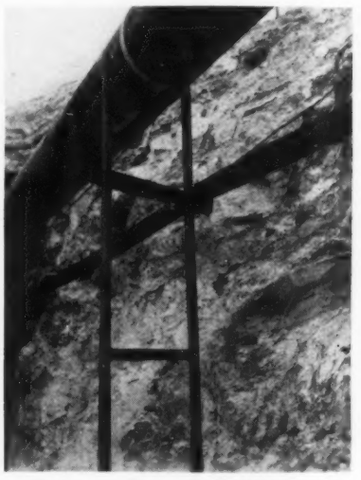
A plot of resistivity at progressively increased depths will indicate by its characteristics the presence or absence of water in the vicinity. A perfectly homogeneous soil gives a flat resistivity curve, a rising curve indicates increasing resistivity with absence of moisture, while a drooping curve indicates decreasing resistivity and the probable presence of water as the pick-up electrodes are moved farther apart.

Tests were made at each location with the terminal electrodes separated in steps from 15 to 400 ft., resulting in measurements of resistivity to depths of 133 ft. About two hours was required for two men to make the test. This method of eliminating unfavorable locations resulted in a distinct saving in time and labor over the old method of boring test holes by hand and greatly speeded the relief work, reports Prof. R. W. Warner in the *Kansas Engineer* of January, 1935.

•

Ventilating Pipes Support Circuit

In driving tunnels for the Metropolitan Water District's aqueduct construction engineers developed a simple, inexpensive support for electric circuits. Wires are carried on the underside of the steel ventilating pipe, which affords a degree of protection not usually found in construction practice.



Circuit supported beneath a ventilating pipe

Special insulator assembly is mounted on a steel band passing around the pipe. With this type of construction wires are out of the way and well protected.

As shown in the accompanying illustration, the wires are supported on porcelain insulators affixed to a steel band passing around the pipe, the band being held in position by bolting its two ends on top of the pipe. The insulator assembly is completed before raising the circuit and, in addition to expediting extensions, it provides a high salvage value for the electrical installation.

ELECTRICAL WORLD'S
National Recovery Issue

An O-P-P-O-R-T-U-N-I-T-Y for a double-barreled selling job

Important public utility officials with whom plans for this issue have already been discussed, are enthusiastic in their reception of the idea. They are planning to present their own local stories in the advertising pages of this issue. The whole industry has perceived the need of a strong, united-front presentation of its case. And the Industry now welcomes this definite and practical proposal for meeting this need, by means of a National Recovery Issue of ELECTRICAL WORLD. . . . Here is your chance to do a twofold advertising job at the cost of one.

First—Your advertisement in this issue will line you up solidly with the Industry and swell the inspiring fund of evidence to be presented to National, State and Municipal officials. It cannot fail to foster a definitely better trend of public understanding and appreciation and consequently lead to expansions and betterments by the electric power companies.

Second—The extraordinary interest and attention which will be focussed on this particular issue, on the part of public utility officials, and by the financial backers of these properties, assures you of the largest and most receptive audience you could hope to gather for your message. The proposed extra distribution is described on the left hand page.

A copy of the complete Prospectus for this issue will be sent on request. No obligation involved. Write to ELECTRICAL WORLD, 330 West 42nd St., New York, N. Y.

CLOSING DATE IS MARCH 15

BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

Breaking Down Sales Resistance

Twenty-five hundred industrial plants in the Niagara frontier area have been circulated with an impressive booklet entitled "Save by Modernizing Electrically," issued by the Electrical League of the Niagara Frontier. President Karr Parker says: "This publication calls attention to the economies to be effected by modern electrical equipment—automatic control, electric heating, high intensity lighting. We believe there is a great deal of this business to be had by active and intelligent promotion and aggressive selling—business for the manufacturers and utilities."

Concise, crisp, illustrated messages, showing recognition of works managers' problems, are presented on each page under such title as "*Save* with better light for better sight; *save* with right size and type motors; *save* with modern controls; *save* on your machine drives; *save* with electric heat, and *save* with complete electrification and safe wiring." Each page ends with "Save with electricity."

Each admonition is supported by facts that any one acquainted with production processes will have to admit. References are made to plants in the territory where modern electrical installations have been made, steam plants replaced, etc. Benefits and savings are cited. These can be backed up by file letters from the owners of plants testifying to the facts, declares Mr. Parker. The comments consider factory problems and solutions, which are bound to interest the readers more than emphasizing equipment first. Illustrations provide a factory atmosphere.

To capitalize on the interest that may be aroused, the last page says in bold type: "Let Us Take a Walk Through Your Plant and Pick Up These Wasted Dollars," followed by a request to fill out and mail the attached card, which will bring an industrial engineer to make a thorough investigation and submit recommendations gratis without obligating the recipient. This service is offered again at the close of the back illustrated cover page, headed "Check Your Plant for Unseen Production Costs."

Such approaches prepare a more cordial reception for salesmen by creating an interest in their visits. The salesmen do not have to devote so much time to explaining their mission and consequently can get down to brass tacks in shorter order. It is an excellent method of breaking down sales resistance.

•

Co-operation Builds Home Laundry Sales

Promotional stunts, free offers and other stimulation may have great merit, but selling still pushes quotas over the top, if the experience of the Northern California Appliance Society is any criterion. The society, composed of electrical dealers of northern California, manufacturers, wholesalers and the commercial department of the Pacific Gas & Electric Company, has just completed a one-month intensive campaign for washer and ironer sales, during which only straight selling methods were used.

Aggressive personal selling, backed by adequate advertising and demonstrations, produced a 60 per cent increase in the number of home laundry units sold during the corresponding month of 1933. In obtaining funds the utility matches dollar for dollar the contributions of the wholesalers and distributors. With this money a 48-in. newspaper advertisement of washers and ironers, carrying the theme, "It's thrifty to own a complete home laundry," was inserted in 40 newspapers under the name of the society. This formed the nucleus of direct tie-in advertising by individual distributors, the total advertising for the campaign in addition to the key

Follow Through on Rate Reductions

SURE. THEY'VE JUST LOWERED THE ELECTRIC RATE.
GOIN' TO MINNEAPOLIS?
MINNEAPOLIS has a new and lower residential electric rate! It has two distinctive features. First, it provides a definite reduction. Second, but more important, is the opportunity it creates for you to completely electrify your home.
You can now add such services as electric refrigeration, electric cooking and electric water heating . . and bring your electric rate down to around 2 cents per kilowatt hour. The more electricity you use, the less it costs per kilowatt hour.
Visit our showroom or your electric appliance dealer and see the new electric ranges, electric refrigerators and electric water heaters. Learn how little it will cost to operate them.
Full information as to how you can benefit most from this new rate will gladly be furnished upon request.
NORTHERN STATES POWER COMPANY
Electrify YOUR HOME

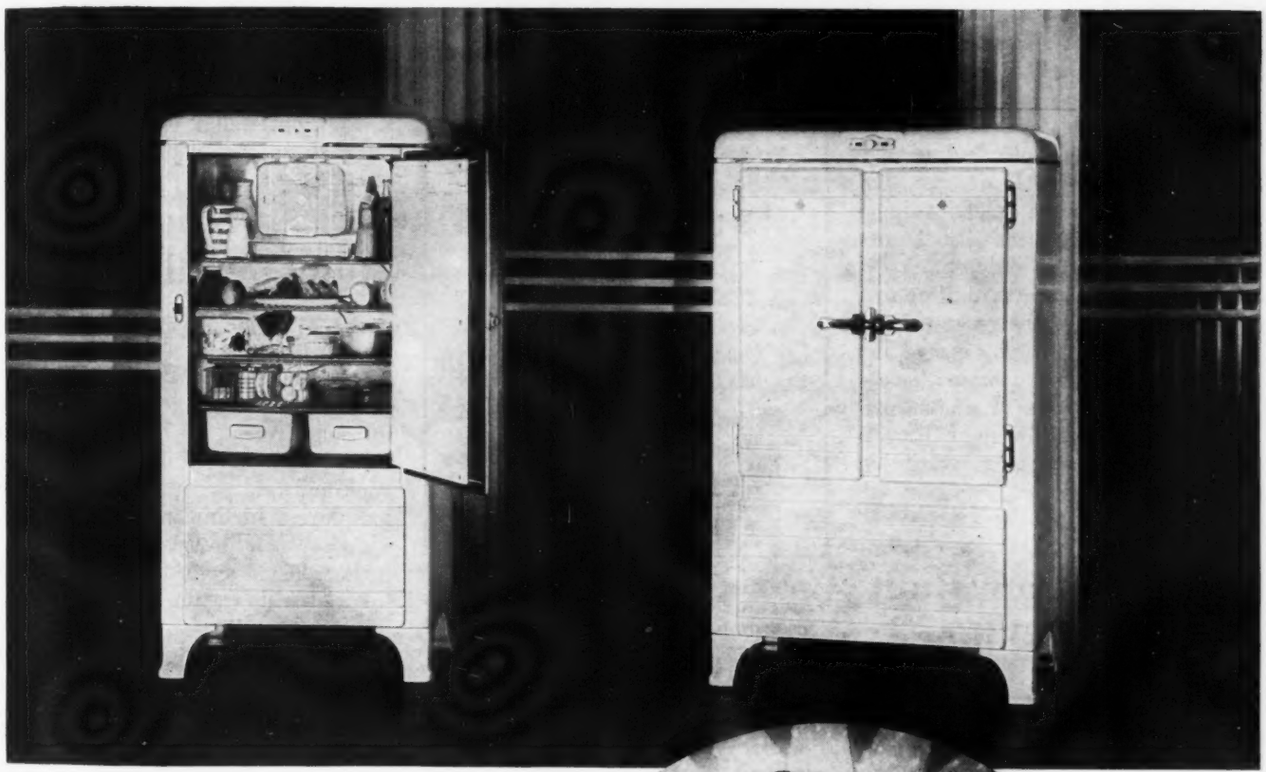
Northern States Power Company has just announced a rate reduction that brings domestic power down to around 2 cents a kilowatt-hour. After this announcement a series of follow-up advertisements started running in the newspapers of practically every retail town served by the company. The idea is to dramatize ridiculous and laughable situations and utilize the little balloons of conversation characterizing the comic strip "even to the distaste of the refined," says T. H. Kettle, advertising manager. "So far we have used three of these follow-up advertisements and they have been the cause of more comment—all favorable—than any advertising the company has ever run."

FRIGIDAIRE '35

FOURTH MILLION

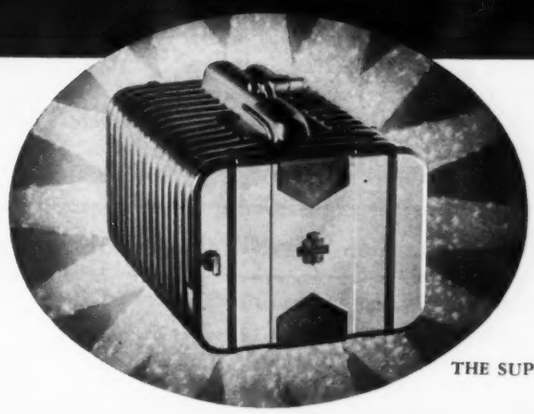
EVERY ONE WITH THE SUPER FREEZER • FOR USERS • MORE SALES FOR DEALERS

THE SUPER SERIES FRIGIDAIRE '35 — THE DE LUXE SERIES FRIGIDAIRE '35



and ice cream. *Extra-cold storage* for keeping a reserve supply of ice cubes. *Moist storage* for vegetables and fruits. *Normal storage* below 50° for foods requiring dry, frosty cold.

And the new line is being presented to the public by the most impressive advertising campaign in the company's history. If you want to see real profits come swinging your way in 1935, it will pay you to investigate the Frigidaire franchise now. Frigidaire Corporation, Subsidiary of General Motors Corp., Dayton, Ohio.



THE SUPER FREEZER

Frigidaire '35

THE GENERAL MOTORS REFRIGERATOR

advertisement being 9,620 in. In addition more than 3,000 in. of free publicity was obtained in the newspapers.

Campaign posters in six colors were furnished to dealers selling equipment included in the campaign and the Pacific Gas & Electric Company, in 60 of its district offices, provided washer and ironer displays and demonstrations. Local women were hired as demonstrators in the various towns and cities. In addition, two of the society's educational department field workers covered the territory conducting demonstrations in key towns, holding schools, giving sales talks to dealer salesmen and otherwise assisting the campaign.

That the activity was effective is indicated by the 2,915 washers and 778 ironers that were sold as a direct result of the month's co-operative sales effort. In the same month last year 1,839 washers and 460 ironers were sold. Aside from the greater volume of sales enjoyed by the distributors and the permanent additions to revenue represented by these units going on the utility's lines, the success of the co-operative campaign has paved the way for enthusiastic continuation of load-building activities of similar pattern. A thorough follow-up of all prospects is now producing gratifying results.

•

Sales Program Built on Load Building

Merchandise sales amounting to $1,000,000 so divided by types of appliances as to produce an estimated annual consumption of 4,500,000 kw.-hr. of electricity is the 1935 accomplishment set for itself by the Public Service Company of Northern Illinois.

Emphasizing Low Cost of Usage

PORTRAIT OF A LADY
earning 1/3¢ an hour
UP AND DOWN, pump, pump, pump. "How my back aches! I have a kink in my leg. Will this dress never get finished?" That's how it is with an old-fashioned foot-treadle sewing machine.
Why should any woman work at things electricity can do for her so much more easily—and so cheaply? Just look. ⅓¢ runs an electric sewing machine for an hour.*
Or the same fraction of a cent will vacuum-clean one room-size rug and give you a start on the second. Wash the dishes for 2 meals. Beat 120 egg whites, four at a time.
Check over the many, many household ways in which electricity takes the place of "elbow grease." Can you think of anything else that does so much to lighten your work, for so little money?
*A landing make of sewing machine in a test ran 75,000 stitches an hour
ELECTRICITY 1¢ your biggest penny's worth
THE NEW YORK EDISON COMPANY
BROOKLYN EDISON COMPANY, INC.
THE UNITED ELECTRIC LIGHT AND POWER COMPANY
NEW YORK AND QUEENS ELECTRIC LIGHT AND POWER COMPANY
NEW YORK CITY SALES TAX FOR RELIEF OF UNEMPLOYED. Charges for electric energy supplied for domestic or commercial use are subject to the addition of the two per cent sales tax imposed by the City of New York under Local Law No. 30 for the relief of the unemployed. This tax is to be paid by the consumer or purchaser to the Company, collected by the Company, and paid to the City by the Company.

Ringing the changes on the cheapness of electricity. The New York Edison group has followed this idea through a series of these portrait advertisements

For the purpose of the program, appliances were considered in two groups—major and minor load building—and separate sales plans set up for each group. Field salesmen will center their efforts on the major load-building appliances, while the minor merchandise will be featured in salesroom specials and offered by bill inclosures. Manufacturers of these devices will be invited to co-operate in these sales efforts.

Salesmen will be compensated on a guaranteed salary or by commissions alone if they total above the fixed amount. This is to say, that a salesman must earn commissions equaling his salary before his compensation rises above it. The schedule of commissions gives the salesman 42.8 per cent higher commission on sales of major over minor load-building appliances. In addition to this extra commission the salesmen will have opportunity to earn load-building bonuses during major appliance campaigns and for outstanding performances during each quarter of the year.

•

Slipping Salesmen Take the Meter Book

Central Maine Power Company salesmen who have gone stale, or who for some reason or other are falling behind their quota, are given a meter book and told to "read meters" for a few days. In this manner they pick up many new prospects, get their appetite whetted again for a real selling job and within a few days are asking to get back selling.

The idea, first tried out because of the success of recruiting salesmen from the ranks of meter readers, was tried out in one of the company's divisions and has worked so successfully that all other places are gradually resorting to the same plan to generate stimulus.

1935 Merchandise Sales Quotas—Public Service Company of Northern Illinois

Major Load-Building Appliances

Item	Quantity	Dollars	Sales Concentration
Refrigerators	2,350	352,500	April 15 to June 31
Ranges, electric	650	92,500	March 15 to April 15 and June 15 to September 15
Water heaters, electric	280	33,600	Same as for ranges
Ironers	820	49,200	February 1 to March 15 and September 1 to October 1
Washers	2,055	123,300	Same as ironers
Portable lamps	12,980	64,900	January, October and November
Kitchen units	1,100	2,200	Same as for lamps
Total, major appliances		$839,200	

Minor Load-Building Appliances*

Item	Quantity	Dollars	Sales Concentration
Vacuum cleaners	1,500	45,000	March
Food mixers	2,060	30,900	January
Percolators	1,650	6,600	May
Flat irons	6,700	20,000	February, July
Toasters	3,300	13,200	August
Miscellaneous (incl. lamps, clocks, table cookers, space heaters, fans, radiant fires and many others)	15,000	60,000	October
Total, minor appliances		$175,800	
Grand total		$1,015,000	

*Christmas specials pushed in November and December.

Sales and Rates ~ today the center of attention ~ ~ ~

Regardless of your position in the matter of load building, the vital results of inducement rates must be weighed in the light of their potential profits at various levels.

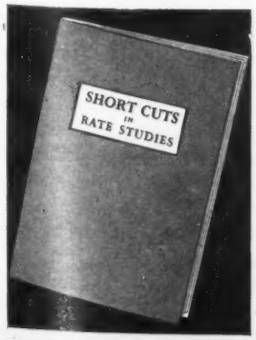
To do this with any degree of safety in forecasting, a comprehensive analysis of customer records must supplant any "sample" analysis.

Nothing short of a full year's consecutive customer billings can form a sound basis for a decision.

Such an analysis can be made readily . . . . . quickly too . . . . . without interrupting routine office procedure.

R & S highly trained and experienced specialists will cast up for you a complete analysis of monthly bills and total annual consumption at considerably less cost than if attempted by your regular personnel.

The booklet at left outlines the service and will be sent you upon request . . . . . no charge.



This brief booklet "Short Cuts in Rate Studies" is the result of many years' experience in compiling Bill and Customer Analysis for leading public utilities. Free copies will gladly be sent to interested executives.

Recording & Statistical Corporation

The World's Largest Statistical Service Organization

102 MAIDEN LANE NEW YORK

BOSTON — PHILADELPHIA — CHICAGO — DETROIT — MONTREAL — TORONTO

MEN OF THE INDUSTRY

C. N. Simpson Appointed to General Managership

Carroll N. Simpson, chief engineer of the Gatineau Power Company, Ottawa, Canada, since 1929, has been appointed general manager of that utility. A graduate of the University of Toronto, Mr. Simpson, immediately after leaving the university, entered the employ of the

C. N. Simpson

Northern Canada Power Company and continued on water-power development with that company and Abitibi Power & Paper Company until 1925. From 1926 to 1928 he had supervision of the Gatineau Power developments. His appointment as chief engineer followed.

Mr. Simpson is a member of the American Institute of Electrical Engineers, executive committee of the Canadian Electrical Association and the Professional Engineers of Quebec.

•

▶ THOMAS W. OZLIN has assumed the duties of chairman of the State Corporation Commission of Virginia.

▶ DR. AUGUST HUND, well-known physicist, has recently established a consulting office and experimental laboratory in Los Angeles, Calif.

▶ PROF. KARL MEYER, president of the national standardizing body in Denmark, has been elected president of the International Standards Association for the period 1935 to 1938 inclusive.

▶ S. G. MEEK has recently rejoined the staff of Johns-Manville, New York, as principal utilities contact for New York, New Jersey and southern New England. Prior to his retirement in 1929 Mr. Meek spent 34 years with the Johns-Manville organization, during that period confining his activities entirely to the electrical industry, in which he has a wide acquaintanceship throughout the eastern part of the United States.

•

Ferguson and Bird Head Hartford Electric Light

Samuel Ferguson, president of the Hartford Electric Light Company since 1924, has been elected chairman of the board of directors, succeeding the late Samuel G. Dunham, and Viggo E. Bird, executive vice-president since early 1929, has been elected president. Increasing activities of Mr. Ferguson in connection with the larger problems of the utility industry during the present period of stress prompted the change, which was voted at the recent directors' meeting in Hartford.

Mr. Ferguson's career is well known to ELECTRICAL WORLD readers on account of his outstanding service as a pioneer in developing business on the basis of promotional rates and excellent public relations, his mastery of operating economy and original contributions to management. An engineer by training, he served twelve years in the research laboratory of the General Electric Company before becoming in 1912 vice-president of the Hartford company, where his leadership rapidly expanded from the Connecticut to the national field. A past-

Samuel Ferguson

president of the Association of Edison Illuminating Companies and trustee of the Edison Electric Institute, Mr. Ferguson will henceforth be able to devote himself more freely to national issues affecting the power industry and to broader planning for the Connecticut group of utilities which he heads with such distinction.

Mr. Bird, a former executive of Stone & Webster properties, has been connected with Connecticut utilities for twenty years. After service with a number of consulting firms he became manager of the Fall River (Mass.) Gas Works Company, and went from there to the Connecticut Power Company, New London, in 1913, when it was acquired by Stone & Webster. When the Hartford Electric Light Company acquired control of the Connecticut organization in 1922, he was made vice-president and general manager, and in 1929 became executive vice-

V. E. Bird

president of the Hartford company and in 1933 president of the Connecticut Power Company. Mr. Bird's work for these properties has been characterized by marked talent for maintaining excellent public relations, fostering sound policies in load building and co-ordinating departmental activities in the interest of efficient operation in all phases of utility service.

•

C. E. Norris to Resign Utility Positions

Charles E. Norris, president of the Northern New York Utilities, Inc., vice-president and secretary of the Niagara-Hudson Power Corporation and executive of other utility companies in New York, will resign his utility positions in March to engage again in the practice of law with offices in Watertown. A lawyer by profession, Mr. Norris has been identified with the Carlisle interests since 1925. In that year he was elected president of F. L. Carlisle & Company, Inc., subsequently becoming vice-president of the Niagara-Hudson Power Corporation. It was in 1931 that he was chosen to head Northern New York Utilities.

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▶ THOMAS J. MEEHAN, manager of the RKO theater group at Providence, R. I., has been appointed assistant to the president and will be in charge of publicity

Extruded ... Rolled... then Drawn

Fig. 1 shows tube as extruded. Note smooth interior surface. The micrograph above reveals the grain structure. **Fig. 2** shows same tube after being cold rolled. While the smooth inside surface is retained, cold working completely changes the grain structure throughout the cross section of tube as the micrograph indicates. **Fig. 3** shows finished tube. Note smooth, clean, inside and outside surfaces; also the further complete change in structure to the small grain size so essential to satisfactory condenser tube installations.

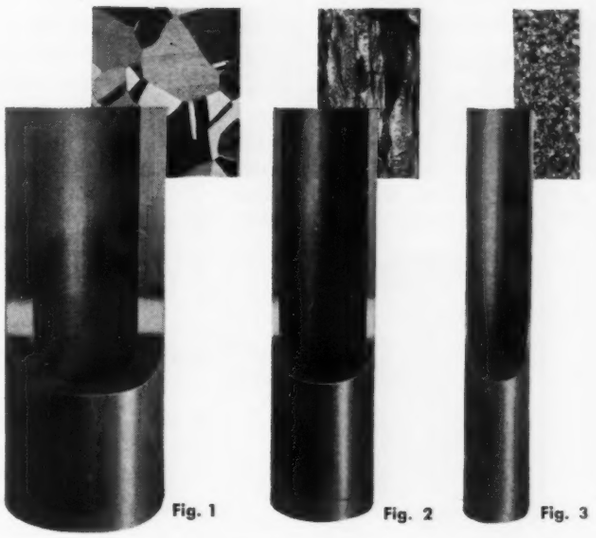

Fig. 1 Fig. 2 Fig. 3

Super-Nickel Condenser Tubes

Made by a new process, superior from every standpoint

ANNEALED tubes of copper, *alloyed with 30% nickel,* provide better physical properties and greater resistance to corrosion and erosion than any other commercial alloy. This is confirmed by the consensus of accredited metallurgical opinion.

Anaconda Super-Nickel (30% nickel) Tubes are recommended for marine and stationary condensers where operating conditions limit the satisfactory performance of other kinds of tubes. For less severe service, other Anaconda Condenser Tubes are offered in all standard alloys, including Ambrac* (20% nickel), Ambraloy* (aluminum brass) and Admiralty Alloy.

And *all* of these Anaconda Condenser Tubes are made by the *extruded, rolled and drawn method.* This Anaconda process . . . the latest of many condenser tube developments introduced by The American Brass Company . . . produces tubes with cleaner, smoother surfaces and a more uniform small grain size than can be attained by other commercial methods.

More complete information and data on all standard Anaconda Condenser Tube alloys and the various methods of tube manufacture are contained in Anaconda Publication B-24. A copy will be mailed upon request.

*Trade-marks Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities
In Canada: ANACONDA AMERICAN BRASS LIMITED, New Toronto, Ontario

NRA CODE

ANACONDA CONDENSER TUBES

and public relations for the Narragansett Electric Company, leading subsidiary of the New England Power Association in Rhode Island.

•

J. A. McCrory Assumes New Executive Duties

James A. McCrory has been appointed vice-president and chief engineer of the Shawinigan Engineering Company, Ltd., Montreal, Que. Mr. McCrory joined the staff of the Shawinigan Water & Power Company in 1916 and on the formation of the Shawinigan Engineering Company

J. A. McCrory

in 1918 was appointed office engineer. He has been actively engaged in the design and investigation of a large number of hydro-electric developments for the Shawinigan utility and other companies. Mr. McCrory was born in Pittsburgh, Pa., and was graduated from Pennsylvania State College in 1907.

R. E. Heartz has been appointed assistant chief engineer of the Shawinigan Engineering Company, Ltd. A graduate of McGill University, he has been identified with the Shawinigan organization since 1920. He has assisted in the design and construction of many of the Shawinigan hydro-electric developments and has served as resident engineer for some of their largest power projects.

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▶ Gordon Cavanagh, valuation and rate engineer, who was with the North American Light & Power Company, Chicago, is now with the Illinois Power & Light Corporation at Monticello, Ill.

▶ Ernest L. Fleming has been appointed assistant general sales manager of the Public Service Electric & Gas Company, Newark. Mr. Fleming has been in the employ of Public Service since 1922 as assistant to the general power representative.

▶ S. F. Myers, who participated in the formation of the Westinghouse Electric & Manufacturing Company's air-conditioning department two years ago, has been appointed sales manager of that department. Mr. Myers, who will make his headquarters in the East Pittsburgh works of the company, has been with Westinghouse since 1915. Since the formation of the department he has been active in sales and promotional operations.

▶ Anning S. Prall of New York has been appointed a member of the Federal Communications Commission by President Roosevelt to succeed Hampson Gary, resigned. Mr. Prall served in the House of Representatives for a period of twelve years.

▶ M. V. Sauer, formerly assistant chief engineer of the Beauharnois Light, Heat & Power Company, has been appointed hydraulic engineer and general superintendent of generating stations of the Montreal Light, Heat & Power Consolidated.

▶ Gano Dunn, president of the J. G. White Engineering Corporation and long active in engineering, science and education, has been elected president of the board of trustees of Cooper Union, New York, to succeed the late R. Fulton Cutting.

▶ William M. Smith, recently appointed to membership on the Michigan Public Utilities Commission, has been elected chairman for 1935. Mr. Smith was the first chairman of the commission in 1919.

▶ D. M. Salsbury, manager for the Westinghouse Electric Supply Company in Salt Lake City, has been named president of the Electrical League of Utah.

▶ D. MacArthur, manager of the Glasgow office of the Metropolitan-Vickers Electrical Company, Ltd., has been appointed manager of the London district office to succeed A. S. Rinder, resigned. Mr. Rinder has become managing director of Alfred Bird & Sons, Ltd., Birmingham.

▶ Joshua T. Day has been appointed general manager of the Malden Electric Company, the Malden & Melrose Gas Light Company and the Suburban Gas & Electric Company, of Revere, Mass., all Tenney properties under the jurisdiction of the New England Power Association. Mr. Day is one of the best known utility executives in the Northeast. He has been resident manager of the Malden Electric Company since 1914, following a connection with the General Electric Company's foreign department and with electric railway properties. He will now have a broader territorial responsibility north of Boston. His work as resident manager at Malden will be assumed by Harry C. Hitchcock, who has been assistant manager since 1929, to which position he advanced from an assistant tellership in 1913.

OBITUARY

W. Rawson Collier

W. Rawson Collier, for 35 years prominently identified with the public utility industry, died in late January in Birmingham, Ala., in his fifty-eighth year. At the time of his death he was manager of the Southern Natural Gas Corporation in Birmingham.

Mr. Collier's most outstanding work was done in the South, where he spent

W. R. Collier

twenty years with the predecessor companies of the Georgia Power Company in Atlanta in a wide range of engineering and executive capacities. Following graduation from the Massachusetts Institute of Technology in 1900, he immediately entered into engineering practice.

From 1901-1904 he was connected with the firm of Collier & Brown, consulting engineers, in charge of the design and construction of more than a dozen large municipal lighting and industrial plants throughout the South. Joining the engineering staff of the Georgia Railway & Electric Company in 1902, he served as assistant engineer, contract agent, sales manager of the successor company, the Georgia Railway & Power Company, operating and sales manager and then as general sales manager. In 1922 he resigned from this position to accept an important executive position with the Central Hudson Gas & Electric Company of Poughkeepsie, N. Y. Subsequent connections included Dwight P. Robinson & Company, U.G.I. Contracting Company, Hall Electric Heating Company and the Southern Natural Gas Corporation. Mr. Collier was a fellow of the American Institute of Electrical Engineers and had been active in several other associations.

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▶ Geoffrey M. Johnston, president of the Universal Cooler Corporation, Detroit, Mich., and chairman of the refrigeration division of the National Elec-

trical Manufacturers' Association, died January 17 in New York. Mr. Johnston had been president of the Universal organization since 1929.

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Wiley F. Corl

Wiley F. Corl, formerly vice-president of the United Gas Improvement Company, died February 5 in Belleville, Ill., as the result of an automobile accident. Mr. Corl, who was 45 years old, resigned from the U.G.I. organization three years ago to join the International Utilities Corporation in New York.

A native of Webb City, Mo., and a graduate of the University of Missouri, Mr. Corl acquired an interest in the Missouri Utilities Company in 1918 and after developing the property he sold it to the North American Light & Power Company. He was elected president of the Community Power & Light Company, but resigned in 1925 to organize the Commonwealth Utilities Company and was president until the company was taken over by the United Gas Improvement Company. He also had been vice-president of the General Management Corporation, Philadelphia.

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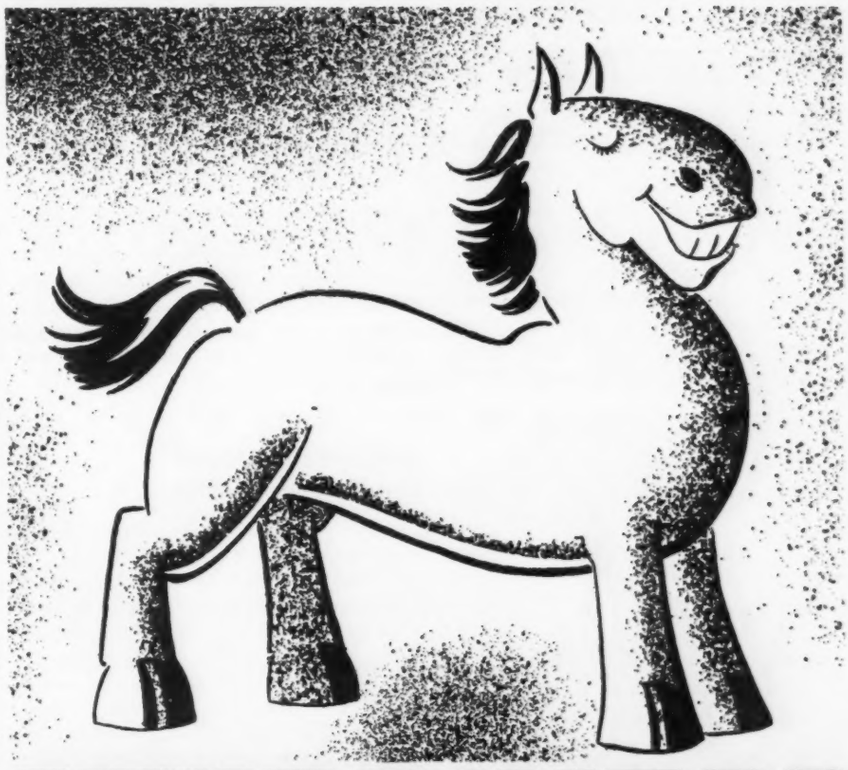
▶ Prof. George Leonard Hosmer, for 37 years a member of the faculty of the Massachusetts Institute of Technology prior to his retirement last fall, and a civil engineer who had been retained in many hydro-electric projects as a consultant, died at his home in Woburn, Mass., January 10, at the age of 60.

▶ Frank R. Ryan, who had been identified with the electric light and power industry since 1921, died suddenly of a heart attack. From 1921 to 1925 Mr. Ryan was president of the Morgan (Utah) Electric Light & Power Company and the five years which followed he spent operating the North Branch (Mich.) Electric Works. Subsequently he transferred his interests to California as owner of the Weaverville Electric Company, Weaverville, Calif.

▶ Adam Gschwindt, formerly manager of the Rockford properties of the Central Illinois Electric & Gas Company, died at Rockford, Ill., January 21. He was head of the local utilities from 1913 to 1933. Mr. Gschwindt entered the public utility field in 1898 with the City Steam Company in Scranton, Pa. Subsequently this company was merged with the Scranton Electric Company. In the early part of the century Mr. Gschwindt was transferred from Scranton to the head office of the American Gas & Electric Company in New York as vice-president and director of purchases. From that post he went to Rockford in 1913.



STURDINESS

● Nineteen hardy Siberian ponies, matching their sturdiness against the storms of the Antarctic, helped Captain Robert F. Scott to reach the South Pole.

National Carbon Brushes, matching sturdiness and carefully chosen characteristics against sudden peaks and prolonged overloads, maintain continuous service through the rigorous winter months.

NATIONAL CARBON BRUSHES will solve your problems

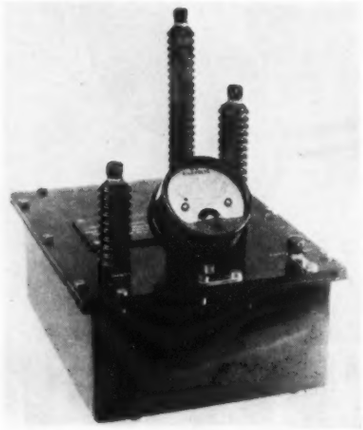
NCC

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division, Cleveland, Ohio
Unit of Union Carbide UCC and Carbon Corporation
NRA CODE
Branch Sales Offices • New York • Pittsburgh • Chicago • San Francisco

NEW EQUIPMENT

Electrostatic Voltmeters

Ferranti Electric, Inc., New York, now offers an electrostatic voltmeter with scale up to 18,000 volts maximum, in single, dual and triple range types. In addition to these high-range instruments, electrostatic voltmeters are announced with scales up to 3,500 volts. Ferranti electrostatic instruments consume no current, are independent of frequency, wave form and temperature and have in the instrument an overvoltage safety device which protects the movement.



Ferranti Electric, Inc.

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1½-Ton Speed Truck

A 1½-ton speed truck designated as Model HS has been announced by the Four Wheel Drive Auto Company of Clintonville, Wis. Speed, sturdiness, ease of steering, smoothness of riding, reliability and safety on the road are claimed for this model. Specifications call for a road speed of 47 miles per hour, with full load. This model is propelled by an 84-hp. engine. Ease of steering, simple handling and equal distribution of load are increased by setting the front axle back 42½ in. from the front bumper. The chassis weighs 5,220 lb. including the cab. Gross weight is 11,200 lb. Wheelbase and body space back of the cab are made variable, according to the demands and needs of the purchaser.

Four Wheel Drive Auto

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Voltage Regulators for Pole-Mounting

Three new automatic voltage regulators have been introduced by the General Electric Company for use on branch feeders and for sections of long feeders. The pole-mount induction voltage regulator functions within limits from a 10 per cent boost to a 10 per cent lower. Automatic or manual operation may be obtained by turn-button control on the panel. Units are in 12- and 24-kva. sizes for 2,400- and 4,800-volt circuits.

The step-voltage regulator provides four steps of 2½ per cent each, arranged for all boost, all lower or any combination of boost and lower, within a 10 per cent range. Suitable for pole mounting and available in 5-, 10-, 15-, and 25-kva. sizes, for 2,400- and 4,800-volt circuits.

The step voltage booster provides a single boost in voltage at heavy demands on single-phase rural circuits and lightly loaded branch circuits. It can be connected to provide a 2½ per cent continuous and a 2½, 5 or 7½ per cent automatic boost, or a 5 per cent continuous rise and a 2½ or 5 per cent automatic boost, or a 7½ per cent boost and a 2½ per cent automatic boost. The booster is designed for 2,400-volt circuits in five ratings from 1.5 to 15 kva.

•

RESONANCE CALCULATOR, a Model LCP circular slide rule for resonance calculations, is now available at $1 from Lightning Calculator Company, Bogota, N. J. Scales for inductance, capacity, frequency, reactance and wave-length on the card and its two rotatable disks cover a broad range (*e.g.*, inductance from 1 michrohenry to 10,000 henries.

UNIVERSAL STEEL OR ALUMINUM CABINETS for adapting old meters to new sequence without altering the meter have been announced by Walker Electric Company, Atlanta, Ga. The cabinets, which fit any size glass case meter, are weather and tamper-proof, are easy to install and take the new bakelite floating test block.

Revolving Shelf Featured in Household Refrigerator

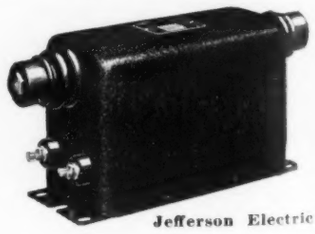
The new streamlined de luxe refrigerator, featuring a revolving shelf, is one of a series of three refrigerators introduced by the Westinghouse Electric & Manufacturing Company in its 1935 line. The shelf feature permits accessibility to stored food and storage space for tall bottles is available in the corners of the lower shelf. The shelf rotates freely, yet locks into position when not in use. A guard rail around the shelf protects the dishes and prevents sliding. Other features of the refrigerator include: Eject-o-cube tray, a handy tray on the door, refrigerated fruit bin, salad crisper and dairy tray.

Westinghouse

•

Transformer for Luminous Tube Signs

Newly designed Jefferson transformers for luminous tube signs which are more than an inch narrower than previous models have been announced by the Jefferson Electric Company, Bellwood, Ill. The case is drawn from a single sheet of rust-resisting copper-bearing steel which is finished by galvanizing and enameling; the core is made of



Jefferson Electric

For Fewer Service Interruptions Use S & C

DISTRIBUTION FUSE LINKS

They cut down number of interruptions, save service calls, prevent damage to fuse tubes, because of:

- Fewer Outages. Materials used in the S & C link do not corrode so there is no change in time-current characteristics nor lowering of blowing point of fuse.
- S & C is a slower link withstanding momentary transients and surges.
- Greater Accuracy in blowing characteristics also means fewer operations than where characteristics are variable.
- Greater Mechanical Strength,—less breakage in handling.
- Shorter Arcing Time saving damage to tube and reducing the expense of fuse tube replacements.

S & C has applied its long experience in present-day requirements with the desire to contribute to the industry.

S & C Fuse Links may be supplied on either 100% full capacity basis or 65% (NEMA rating) constant current carrying basis—for S & C Cutouts.

Their performance has been demonstrated in expulsion type cutouts, which makes the Universal use of S & C links economical on your system.

S & C Links—full capacity—also give satisfactory service in expulsion fuse tubes in addition to their use in the line of S & C Distribution Cutouts, as has been thoroughly demonstrated by performance results on this design of the 65% rated link.

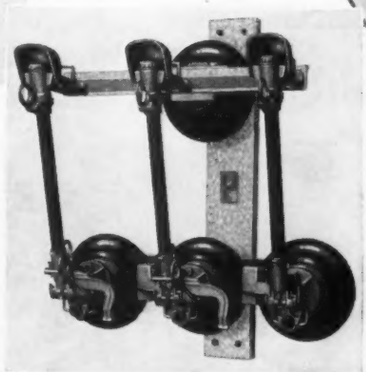
Ready for immediate delivery—write or wire.

REG. U. S. PAT. OFF.

Cut-away section shows fusible element and strain wire.

Semafor Box Cutout for distribution service, 5 kv. up to 60 amps. When fuse blows, the door which carries the fuse tube drops open. Universal fuse link also used for these cutouts and same snappy arc interruption within the fuse tube is provided. Ordinary switch stick removes door and tube.

Semafor Open Type Cutout for distribution service, 5 kv. to 15 kv., up to 100 amps. Arc is ruptured inside the tube and generous gap established instantly. Universal fuse link fits all other expulsion type cutouts having 5/16" or 7/16" bore tube.



AT RIGHT: S & C Recloser—designed for use with S & C Universal links. When short circuit occurs, fault is cleared in first tube and then tube drops open which reestablishes circuit through second tube. This acts similarly if fault is maintained and the current is reestablished through the third.

SCHWEITZER & CONRAD, Inc.

4435 Ravenswood Avenue, Chicago, Ill.

S & C Liquid Fuses • Distribution Cutouts • Potential Transformer S & C Liquid Fuses • Potential Transformer Resistors • Power Transformer Resistors • Fuse Mountings (Indoor & Outdoor) • Fused Disconnects (Indoor & Outdoor) • Disconnect Switches (Indoor & Outdoor) • Bus Supports (Indoor & Outdoor) • Horn Gap Switches • Voltage Detectors • Fuse-Switches • Universal Distribution Cutout Fuse Links.

high silica non-aging steel; coils are vacuum treated and imbedded in processed compound to insure highest dielectric strength, and rapid heat conduction insures operation with unusually slight heat rise.

•

Ignition Transformers

Ignition transformers for burner service now available with detachable plug-type high-voltage terminals at the bottom of the case have been announced by the General Electric Company. These units are particularly adaptable where it is desired to inclose the high-voltage circuits completely. They are obtainable with slots in the base of universal mounting or with studs for concealed mounting. These class E transformers are balanced electrostatically, an electrostatic shield separates the high-voltage coils, and these features combine to minimize radio interference.

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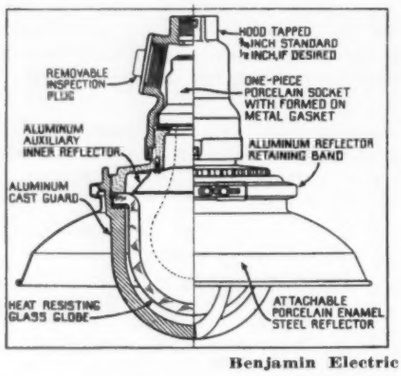
Explosion-Proof Lighting Fixtures

A line of inclosing-globe-type explosion-proof fixtures, to which can be attached any of four standard porcelain enamel steel reflector shapes, and which com-


HOOD TAPPED
½ INCH STANDARD
¾ INCH IF DESIRED
REMOVABLE INSPECTION PLUG
ONE-PIECE PORCELAIN SOCKET WITH FORMED ON METAL GASKET
ALUMINUM AUXILIARY INNER REFLECTOR
ALUMINUM REFLECTOR RETAINING BAND
ALUMINUM CAST GUARD
HEAT RESISTING GLASS GLOBE
ATTACHABLE PORCELAIN ENAMEL STEEL REFLECTOR

Benjamin Electric

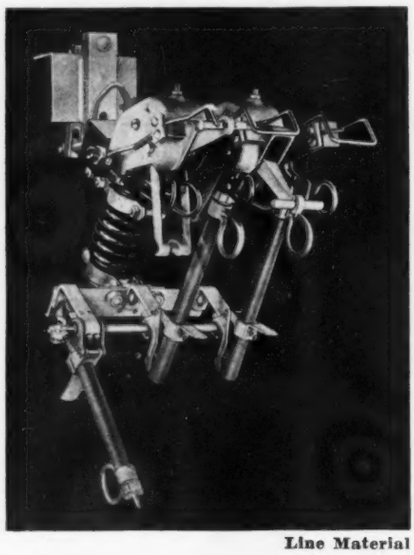
pletely satisfies all Underwriters' requirements for installation in Class 1, Group D hazardous locations, atmospheres having vapors of gasoline, naphtha, etc., is announced by the Benjamin Electric Manufacturing Company, Des Plaines, Ill. Fixtures are supplied with either pendent hood or junction box hood for ceiling mounting. Hoods have removable inspection plug for access to wiring terminals. The one-piece socket provides a barrier between the globe and hood so that explosions originating in either space cannot be transmitted to the other.

•

FEATURES OF THE type 478 Pyrometer Controller announced by the Bristol Company, Waterbury, Conn., are clean mercury to mercury electrical contacts, absence of relays, visible operating mechanism, accessibility of parts and accurate control.

Adjustable Time Delay

An adjustable time delay as standard equipment is incorporated in the "RLD" reclosing fuse cutout announced by the Line Material Company, South Milwaukee, Wis. The cutout is built in single



Line Material

reclosure or two-reclosure types and the fuse cartridges are interchangeable among themselves. This cutout is of the type where all cartridges are in the up or closed position when the fuse links are intact. Transferring of the circuit to the next adjacent fuse after the first fuse has blown is accomplished through a transfer switch on which the delay device acts. This delay device can be adjusted to a timing from instantaneous to two seconds. The cutout is available for 100 amp. capacity, in two- and three-unit designs and for voltage ratings up to 15,000 volts.

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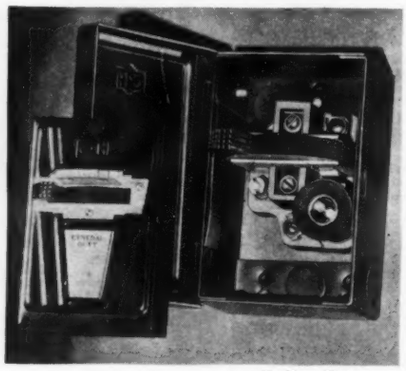
Safety Switch

Cutler-Hammer, Inc., Milwaukee, Wis., has introduced a new safety switch which is designed to meet requirements



Cutler-Hammer

for a 30-amp. switch adaptable for use with oil burners, domestic stokers, air-conditioning equipment and electric unit heaters. The switch, which is of the fusible type, has a front-operated, double-pole, positive make-and-break toggle mechanism and occupies a space 3½x5½x3½ in.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Proposed federal specifications for non-renewable plug fuses have been issued by the Federal Specifications Board, Room 735, Federal Warehouse, Washington, D. C.

A folder issued by Struthers Dunn, Inc., Philadelphia, describes its line of relays, timing and electric counting devices, thermostats, electric pots and ladles, together with the engineering service the company renders.

Steelduct Company, Youngstown, Ohio, has announced a catalog showing lines of conduit and giving tables of weights and dimensions of conduit, elbows and metallic tubing.

Application, construction and operation information, with circuit connection diagrams, for type DD-6 temperature indicating instruments are included in a folder issued by the General Electric Company.

Ohio Carbon Company, Cleveland, Ohio, has announced a 64-page booklet on the brush phases of motor maintenance. Commutation, current collection in a.c. machines, physical and electrical properties of brushes and installation and maintenance of brushes are covered.

Alignment charts and much data for applying the Thermostatic Bimetal of General Plate Company, Attleboro, Mass., are in new Bulletin 301, entitled "Truflex."

Engineering data sheets, ratings and specifications of flexible, parkway, secondary network, armor and lead sheath cable and service entrance leads are included in the 35-page bulletin announced by the Crescent Wire & Cable Company, Trenton, N. J.

Construction details, specifications, applications and capacities of Emerson household ventilating fans are included in a catalogue recently published by the Emerson Electric Manufacturing Company, St. Louis, Mo.

A 32-page report of the A.S.T.M. committee A-5 on corrosion of iron and steel discusses details of exposure tests under way. Coating failures are indicated and data on progressive rust development are given. Copies are available at 260 S. Broad St., Philadelphia, Pa., for 50 cents.

B. F. Goodrich Company, Mechanical Division, Akron, Ohio, has announced a bulletin containing engineering specifications, speed and load ratings and installation information on transmission, conveyor and elevator belting. Specifications of hose for transmission of air, water, steam and oils are also included.

A bulletin covering circuit connection diagrams, construction information and operating characteristics of polyphase power-directional relay-type IKP has been issued by the General Electric Company.

List prices of induction motors (¾ to 75 hp.) are presented in a new circular, "Juice Wheel," of the Louis Allis Company, Milwaukee. Data cover standard sleeve-bearing, ball-bearing, splash-proof, inclosed explosion-proof motors, 220-550 volts. Accessories are tabulated on the back.

A PRESENT
YOUR PLANT WILL APPRECIATE

Here's a tip—give your plant a present that will keep it happy for a long, long time. Decide now to give your men and your machines an electrical steel that both will like—and do yourself, whether owner, engineer or plant manager, a favor at the same time.

We're talking about Sil-con, Republic's Perfected Electrical Steels, and particularly Sil-con Coiled Strip. It is uniform in temper and gauge and, therefore, easy on dies. It cuts scrap loss and almost eliminates end waste. It is easy to handle. Coil set is removed, making it stack flat. There is no loose scale to clog the dies. It speeds up production, and, with the correct press equipment, it cuts labor costs. And in electrical performance, it is guaranteed equal to the finest sheets obtainable in the equivalent grade.

Five grades permit the selection of the best for your particular needs—Armature, Electrical, Special Motor, Special Dynamo and Regular Transformer, gauges 22 to 30 inclusive.

Prices and additional facts on request.

Licensed under patents 1,867,818; 1,932,306 to 1,932,309 inclusive; and other patents applied for.

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

LETTERS TO THE EDITOR

Says Depreciation Not Skimped in Jacksonville

To the Editor of ELECTRICAL WORLD:

Your news item of January 19 places an erroneous interpretation on the Taylor Engineering Company's reports and also upon the editorial in the December 21, 1934, issue of the Jacksonville *Journal*. I have written Editor Sanders of the *Journal* in detail and wish you would at least publish the following excerpts from that letter:

There has been no more encouraging news for the people of Jacksonville than was brought out in this report, which forever stamped as false the rumors that Jacksonville was not maintaining its electric system in the proper manner. The report shows the only replacement necessary is an item of $17,000 for replacement of windows and window-operating gear in the original power plant, constructed in 1912. The report stated the entire system was in first-class condition and well maintained. Mr. Taylor personally stated to me that he considered the plant in as good a condition as, if not better than, any plant of equal size of which he knew. . . .

The plant, on account of increasing business, is about to outgrow its capacity, and it will be necessary to spend $2,437,000 for additional equipment, over a five-year period, to provide for this increase. . . . Some people seem to be under the impression that the city of Jacksonville has operated its electric system for years and has forgotten maintenance and replacements. In the past five years alone we have spent $1,666,000 for this, or an average of $333,500 per year, which is equal to approximately 3.3 per cent of the total assets and would amount to more than 4 per cent on the depreciable assets. I venture to say this percentage is equal to any amount set up or spent by any privately or publicly owned plant for this purpose. The engineers' report bears out the fact that we have spent a sufficient sum for maintenance and replacements.

The plant has earned $9,087,387 net profit in the past five years, or approximately $1,817,500 yearly. Of this $1,300,000 has been the average contribution toward tax reduction, the balance of $517,500 being used for interest on bonds, sinking fund, extensions, etc. It can readily be seen that the estimated increase in consumption will naturally mean an increase in net revenue, which we hope will practically take care of the recommended extensions over this five-year period, and the amount for general fund will not have to be materially reduced.

E. E. ANDERS,
Commissioner Public Utilities,
Jacksonville, Fla.

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Two Paths to Capital-Cost Reduction

To the Editor of ELECTRICAL WORLD:

I was very much interested in the possibilities for capital-cost reduction as outlined by Frank S. Clark of Stone & Webster in the January 19 issue. While many of these proposals have been put forward independently from time to time, and some put into practice with gratifying results, their reiteration by one who has been in a position to study and weigh these factors thoroughly will command serious attention.

While I find myself in general agreement with Mr. Clark, I should like to emphasize one or two points. He says: "There has been a tendency in the past on the part of both company and consulting engineers to request complete performance data and proposals on numerous types and sizes of equipment for a number of different operating conditions where, possibly, a more careful analysis of the situation would have reduced the number of studies to be made." This practice is still quite prevalent and obviously enters into the initial cost. Greater forethought on the part of the engineer who initiates such proposals would eliminate many of these studies and at the same time leave the way open to the most economical combination for the given case. Much useless time and expense would be saved thereby.

The second point I should like to emphasize is "dollar efficiency." For a time too much importance, perhaps, was attached to thermal efficiency and too little to the economic efficiency, if fixed charges, maintenance and possible outage be considered. However, during the halcyon years this strife for increased thermal efficiency, whatever the cost, did advance power plant practice to its present standard of performance. Taking full advantage of this, it seems that the time has now arrived to pause for a while and give due consideration to economic efficiency.

Mr. Clark is to be congratulated on having charted a course that forms a basis for reduced investment costs.

R. M. GATES,
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BOOK REVIEWS

Electron Tubes in Industry

By Keith Henney. Published by McGraw-Hill Book Company, New York. 475 pages, illustrated. Price, $5.

Gaseous tubes with their larger currents, lower voltage drop and small grid power requirements have taken the electron tube into industrial applications. They are proving admirable as amplifiers for controlling mechanical functions. More than half of this book is devoted to them and to the equally important light-sensitive tubes. Among a large number of practical applications in industry are found a method of synchronizing conveyors, a phase-failure relay, high-speed counting and controlled welding. In fact, this text by the author of the Radio Engineering Handbook does just what it sets out to do—recite the properties and characteristics of electron tubes as they have grown far beyond the realm of radio and then record the principles and assembly details of a large array of applications already to some extent recorded in electronic literature.

The treatment transcends the "stumble-upon" type of experimentation. It correlates the function to be performed with the advantageous characteristics of the tubes available. The reader who wishes to find a solution in detail will either discover it fully executed or find the clear-cut principles on which it can be solved. When the field of industrial electronics is fully appreciated it will have its own engineering handbook. Meanwhile, this work is the first integration of the technique in this evolving field.

•

Government Ownership of Power and Light Utilities

By Claiborne A. Duval. Published by the University of Texas, Austin, Tex. (Bulletin 3438) 264 pages. Price, 25 cents.

This bulletin treats the government ownership institution as a debate, setting up, first, the brief and the general material in coaching fashion. Affirmative material takes 100 pages and negative 90 pages, both being largely citations of addresses, testimony and articles. Private ownership presentation is weak because it is confined to a limited number of sources.

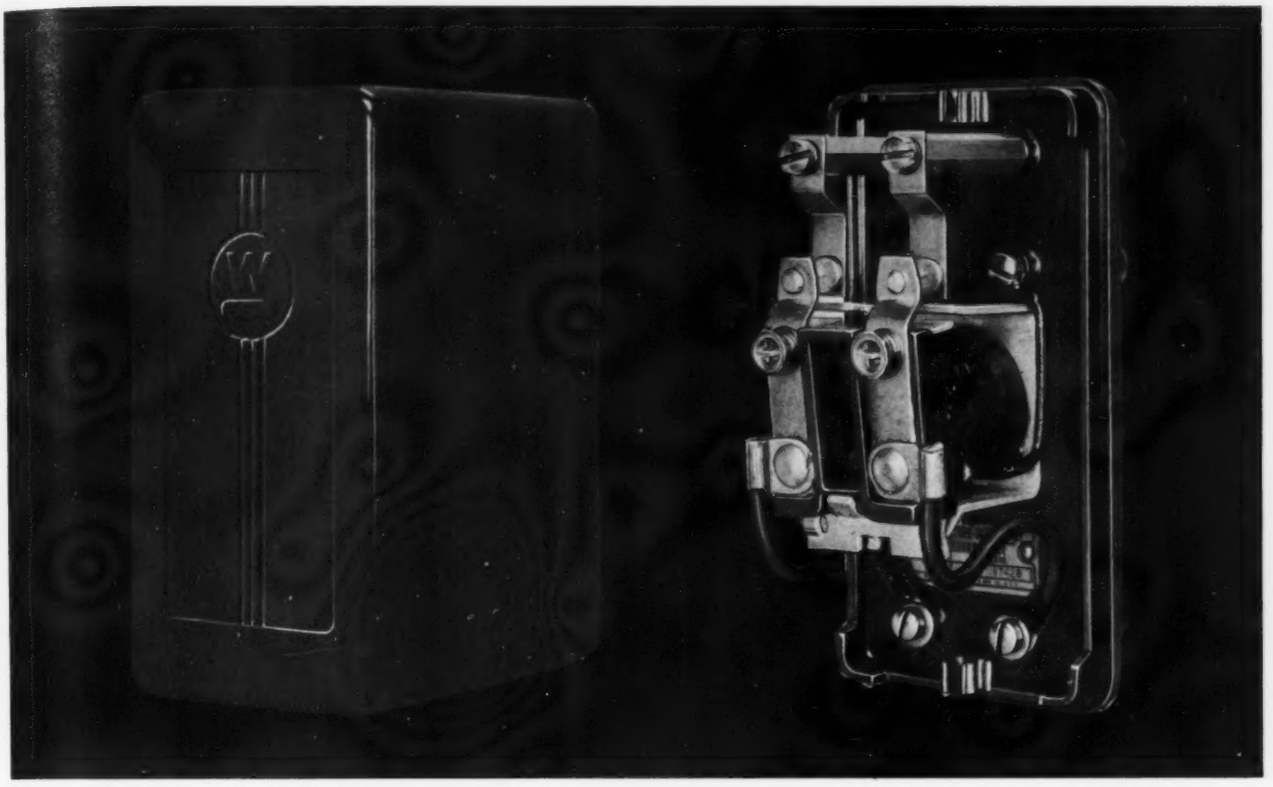
•

A Text Book of Applied Hydraulics

By Herbert Addison. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 398 pages, illustrated. Price, $5.50.

Electrical engineers were reasonably prominent in the mind of the author when he set out to assemble compactly the fundamentals and practices of hydraulics as the power engineer needs to know them. Six chapters are on principles and nine on their practical application to pipe systems, channels, turbines, pumps and hydraulic measurements. Hydraulic energy storage and transmission command one of the nine practice chapters.

Realizing that hydraulics is beset with many empirical formulas, the author cites several alternatives at each point and comments on their respective virtues. Discussion of hydraulic apparatuses transcends mere description—it treats their design and performance in the light of the principles on which they function. There are 125 numerical problems, with solutions in many cases and answers in all cases. The author is professor at the Royal School of Engineering, Giza, Egypt.



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Recent Rate Changes

Wisconsin Public Service Commission has ordered all the private and municipally owned electrical utilities in the state to show cause why a new low-cost rate plan should not be established for electric service to residential and small commercial lighting users. The purpose of the plan is to bring to large numbers of electric customers the advantages of increased use at lower costs than have heretofore prevailed. Under the new schedule in a city of 8,000 or more population the consumer would be given a 2-cent net rate a kilowatt-hour for all electricity used in excess of the amount used in the corresponding month of 1934. For consumers in cities of 2,000 to 8,000 population this excess over 1934 consumption would be at 2.25 cents a kilowatt-hour, while for communities of less than 2,000 population the rate would be 2.5 cents.

•

Maryland Public Service Commission has rejected another set of electric rates filed with it by the Potomac Edison Company and has notified the company that, acting upon authority of law, it will begin the preparation of schedules of rates which will distribute the reduction in a manner the commission feels to be proper (ELECTRICAL WORLD, February 2, page 84). These rates will be retroactive to February 1 meter readings.

•

Syracuse Lighting Company has filed a petition with the New York State Public Service Commission to reduce residential electric rates approximately $126,000 annually. In addition to the petition for an immediate rate reduction, the company is establishing a new "share-the-benefits" rate policy, by means of which rates will become lower as the average use of electricity increases. The company is a subsidiary of the Niagara-Hudson Power Corporation.

•

Rockland Light & Power Company has reduced electric rates approximately $144,000 annually, effective February 1.

•

Potomac Electric Power Company has been ordered by the Public Utilities Commission to reduce its electric power rates in the District of Columbia $147,821. The greatest portion of this reduction was in the domestic rates.

•

Massachusetts will soon have an authority on rate making if the plans discussed last week at a conference of state officials and utility executives called by Governor Curley materialize. The plan for lower electric and gas rates will be drawn up by a committee of six, three to be appointed by President Frank D. Comerford of New England Power Association. The other three, appointed by the Governor, are President

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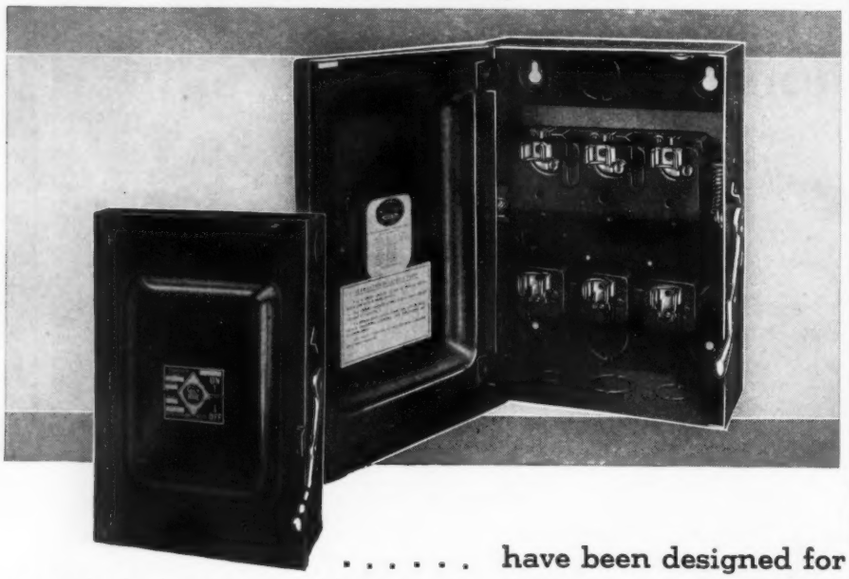

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Karl Compton of Massachusetts Institute of Technology, Prof. J. J. Murray of Boston University and Eliot Earle, whom the Governor described as an authority on rate making, with a particular knowledge of the sliding scale system.

•

Utica Gas & Electric Company has announced a new schedule of electric rates for residential and farm customers which will result in yearly savings of $143,000. The new rates will be effective March 1, except for a small portion of the rural territory, filing for which will be made later. The Utica utility, which is also a subsidiary of the Niagara-Hudson Power Corporation, is planning a new "share-the-benefits" rate plan.

•

Atlantic City Electric Company has granted a rate cut of about 14 per cent for Atlantic City and environs, according to announcement made by the New Jersey Board of Public Utility Commissioners, which had been negotiating for the reduction. Part of the reduction became effective February 1, more will be effective in November and the rest March 1, 1936. The saving to residential consumers will total $236,000, when the full cut is effective; that to commercial users will be $309,000.

•

New York Power & Light Company's new rate schedule, resulting in an annual saving to consumers of $600,000 a year (ELECTRICAL WORLD, February 2, page 82), has been approved by the state Public Service Commission.

•

Mississippi Power & Light Company's compromise rate schedule for electric service in Jackson was finally adopted by the City Council, which repealed the rate ordinance compelling the utility to cut its rates from 15 to 20 per cent. This action by the commission finally concluded the dispute between the municipality and the utility which serves it. On January 19 citizens voted down a proposal for a muniipal electric light and power plant (ELECTRICAL WORLD, February 2, page 46).

•

Eastern Shore Public Service Company of Virginia has filed revised rate schedules with the state Public Service Commission calling for an annual reduction of $7,000 in its domestic lighting rate and of $8,000 in its commercial lighting rate. This $15,000 cut is in addition to a $6,000 reduction made effective June 1, 1934.

•

Arkansas Utilities Company was ordered by the Arkansas Corporation Commission to place in effect January 1 a new rural electric rate structure. The reductions are estimated at from 6 to 19 per cent over rates prevailing prior to January 1.

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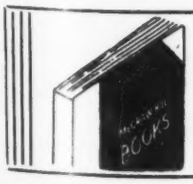

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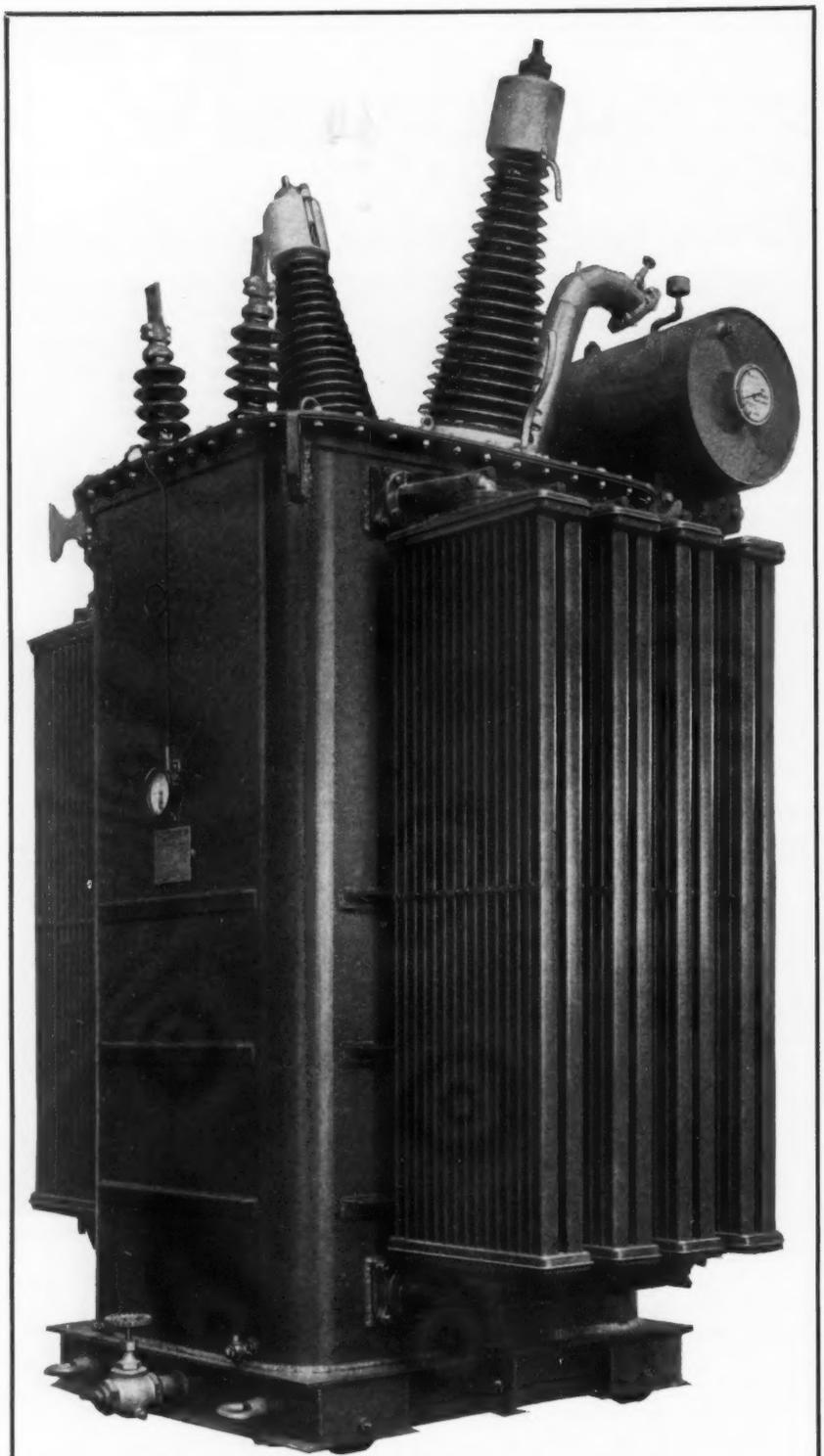

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Most Municipals Are Small

Municipal service is available in 1,861 communities having an aggregate population of 9,457,636, or about 8 per cent of the country's entire population, with 2,291,373 meters in service. A booklet compiled under the auspices of the Federal Emergency Administration of Public Works and entitled "Municipally Owned Electric Utilities in the United States, 1934," lists these places and includes a map showing their location.

Municipal plants comprise 5.6 per cent of the total kilowatt rating of central stations and are operated by 934 communities. An almost equal number of places purchase all energy sold. In addition there are 37 places, most of them large cities, that have their own plants for street lighting and municipal service only.

In a general way it has long been known that the region in which municipal service is most popular is the great agricultural Middle West, and that it prevails in the smaller rather than in the larger communities. This P.W.A. survey now provides the data. In the country as a whole there are only eight cities of more than 100,000 inhabitants having such service—Los Angeles, Cleveland, Seattle, Columbus (Ohio), Jacksonville, Kansas City (Kan.), Fort Wayne and Tacoma—with a combined population of 3,267,793. In five of these there is more or less competition from private companies. The largest place having municipal service exclusively is Jacksonville (population 129,549); the other two are Kansas City and Tacoma.

There are eight in the population group of 50,000 to 100,000, with 526,848 inhabitants, and twelve in the 30,000 to 50,000 group, with 446,260 inhabitants. This leaves 1,833 places with 5,216,735 inhabitants in the group under 30,000, giving an average of 2,850 per community.

Concentration in the Mid-West is shown by the list of states having more than 100 municipally served communities: Nebraska, 167; Kansas, 139; Iowa, 127; Minnesota, 122; Ohio, 118. These five contain more than a third of all municipal establishments in the United States, but they serve only 2.1 per cent of all electric light and power customers in the country. Excepting the last, they are all states having a comparatively small population spread over a large area. In each of them the municipalities operating on purchased energy definitely

Kind of Plant	Number	Rating Kw.
Steam engine or turbine	414	1,111,799
Oil or gas engine	528	279,443
Water power	148	490,583
Total places having plants	934	1,882,645
Places purchasing all energy used	927	

outnumber those having their own plants, the group average ratio being five to four. Those west of the Mississippi River are notable for the abundance of very small oil or gas-engine plants, with ratings from 15 kw. upward.

The table on page 88 classifies the plants by type of prime mover.

•

Survey Shows Wide Use of Standards

It may be surprising to some readers to know the extent to which nationally recognized specifications or standards are referred to in commodity standards and NRA codes and how much the standards familiar to the electrical industry are incorporated in industrial codes and specifications. But before this is brought out it should be pointed out that this information came out of a federal analysis of all nationally recognized specifications and standards, all commodity standards and all NRA codes or proposed codes of fair competition up to and including September 30, 1934.

Out of 1,233 codes and supplements reviewed for the Consumers' Advisory Board, there were 653 which had specifications formulated or sponsored by 187 separate agencies. In 198 of the 519 codes that had received official approval there were definite references to existing standards or creation of committees to formulate standards.

An analysis of codes of fair competition and supplements thereto thus far approved shows that in 199 references are made to existing standards or creation of standards committees. In 85 of these approved documents references were made to 43 agencies under whose auspices existing standards have been promulgated.

Symbol	Agencies Promulgating Standards Familiar to Electrical Field (Partial List)	Number of References in Commodity Specifications	Number of References in Approved Codes
NBS	National Bureau of Standards..... simplified practice recommendations (219) commercial standards (87) safety codes (42)	348	41
USBM	U. S. Bureau of Mines.....	.....	1
FTC	Federal Trade Commission	17	.....
ND	Navy Department.....	2	.....
ASTM	Amer. Society for Testing Materials.....	296	5
ASME	Amer. Society of Mechanical Engineers.....	71	1
ASA	American Standards Association	.....	3
UL	Underwriters' Laboratories	20	2
NBFU	National Board of Fire Underwriters.....	17	1
NFPA	National Fire Protection Association.....	9	.....
AIEE	American Institute of Electrical Engineers....	5	.....
NEMA	National Electrical Manufacturers Association...	4	.....
AEIC	Association of Edison Illumfnating Companies	3	.....
AISEE	Association of Iron & Steel Electrical Engineers....	3	.....
IES	Illuminating Engineers Society.....	3	.....
AEC	American Engineering Council.....	2	.....
AEPS	American Electroplaters' Society.....	1	.....
EEI	Edison Electric Institute..	1	.....
SPA	Southern Pine Association	1	.....
WPA	Western Pine Association.	1	.....

SALES OPPORTUNITIES IN NEW CONSTRUCTION

RICHMOND, VA.—Virginia Electric & Power Company is arranging fund of about $1,750,000 for construction and improvements in 1935, including extensions in transmission and distributing lines for service in new territory, power substations and miscellaneous work.

OROFINO, IDAHO — Washington-Idaho Lime Products Company, Spokane, Wash., plans installation of heavy-duty motors and controls, conveyors, loaders and other equipment in proposed new cement mill. Cost close to $400,000.

BROOKLYN, N. Y.—Signal Supply Officer, Army Base, asks bids until February 25 for 30,000 feet cable and 12 reels (Circular 83).

STEPHENVILLE, TEX.—Plans new city-owned electric light and power plant. Cost $196,000 with distributing lines. Special election called on February 26 to approve bond issue in amount noted.

KIMBERLEY, NEV. — Consolidated Coppermines Corporation, 120 Broadway, New York, N. Y., plans installation of motor-generator set, motors and controls, electric hoists, conveyors and other equipment for development of mining properties at Kimberley and new refining plant. Fund of $3,000,000 has been secured by RFC loan.

ROCHESTER, N. Y.—Rochester Gas & Electric Corporation plans expansion and modernization in main generating station, including installation of new turbo-generator unit and accessories, high-pressure boiler and complete auxiliary equipment. Work scheduled to begin early in spring. Cost about $1,000,000.

MEADVILLE, PA. — Hookless Fastener Company plans installation of motors and controls, conveyors, etc., in new multi-story addition. Cost about $375,000. Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, Ohio, are architects.

ST. LOUIS, MO.—Plans new street-lighting system on number of streets in northern part of city. Cost about $75,000.

MOUNT VERNON, OHIO — Pittsburgh Plate Glass Company, Pittsburgh, Pa., plans installation of motors and controls, regulators, conveyors and other equipment in connection with expansion and improvements in sheet glass works at Mount Vernon. Cost over $600,000.

LANSING, MICH.—Olds Motor Works, a subsidiary of General Motors Corporation, Detroit, Mich., plans installation of motors and controls, conveyors and other equipment in new addition. Cost about $175,000.

HUDSON, WIS. — Willow River Power Company plans rebuilding of hydroelectric generating plant, recently damaged by flood, caused by failure of St. Croix dam. Loss close to $85,000, with equipment.

SAN ANTONIO, TEX.—Plans city-owned electrical distribution system, including overhead and underground lines, power substation facilities and miscellaneous construction. Estimated cost $4,500,000. Financing proposed through Federal aid.

DENVER, COLO.—Bureau of Reclamation asks bids until February 25 for furnishing and installing two 4,000-pound and two 5,000-pound capacity automatic electrically-operated passenger elevators, total lift of 117.5 feet and 528.33 feet, respectively, at Boulder Dam and power plant, Boulder Canyon Project, Arizona-California-Nevada (Specification 612); also, until February 26 for one 75-ton gantry crane with one 15-ton auxiliary hoist for storage yard, Grand Coulee Dam, Columbia Basin Project, Wash. (Specification 646-D).

NEW YORK, N. Y.—Procurement Division, Treasury Department, Washington, D. C., has appropriation of $3,780,000 for new Federal-owned and operated generating plant at New York, for light and power service for group of Government buildings. Plans are under way. Project will include main power plant, power substations, underground conduit system and other electrical distribution lines, service connections, etc.

CEDAR RAPIDS, IOWA—Iowa Electric Light & Power Company plans new transmission lines, about 20 miles, in Jasper and Marshall Counties. Application made for permission.

ST. LOUIS, MO. — Monsanto Chemical Company has approved plans for addition to power plant at chemical works at Monsanto, including installation of new equipment. Cost close to $100,000. Stone & Webster Engineering Corporation, St. Louis, is consulting engineer.

HIGH POINT, N. C.—Premier Brewing Company, recently organized, care of Waldemar Mortensen, 103 Park Avenue, New York, N. Y., architect and engineer, plans new plant on large tract of land acquired on High Point-Greensboro Highway. A power house will be built. Cost $150,000.

BOONE, IOWA—Has plans for city-owned electrical light and power plant, and distribution system. Cost about $800,000. Special election is being arranged to approve bonds in amount noted.

OAKLAND, CALIF. — Continental Can Company, New York, N. Y., plans installation of motors and controls, conveyors, etc., in new multi-story addition to plant at Oakland. Cost about $250,000.

MASON CITY, IOWA — Peoples Gas & Electric Company plans extensions in transmission lines in part of Cerro Gordo County. Permission has been asked.

CLEVELAND, OHIO—Steel & Tubes, Inc., plans installation of motors and controls, hoists, conveyors, etc., in new addition to mill, for which a building permit has been issued. Cost about $125,000.

WARRENSBURG, ORE.—P. J. McGowan & Sons, Inc., plan installation of motors and controls, conveyors, loaders and other equipment in connection with rebuilding of portion of fish processing and canning plant recently destroyed by fire. Loss over $175,000.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, asks bids until February 28 for one set of electrical equipment for one towing locomotive (Schedule 3029).

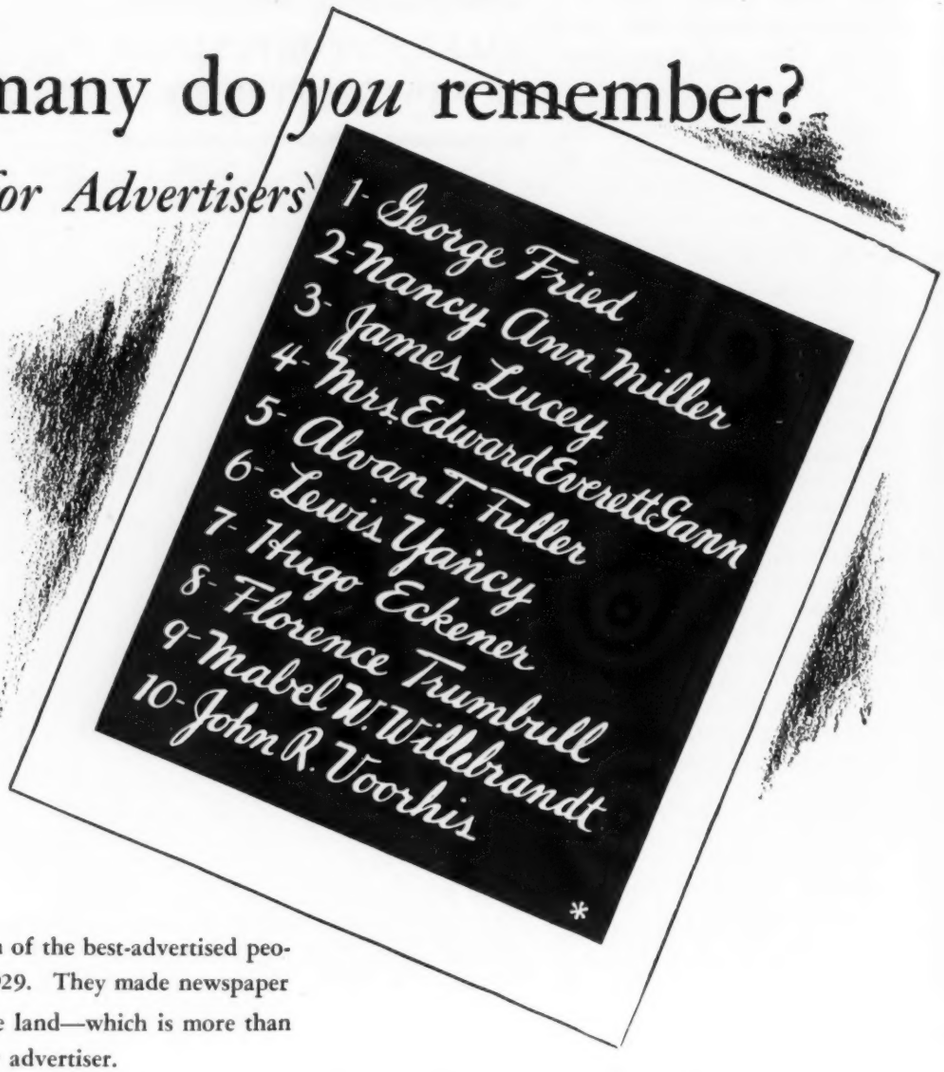
WAUKON, IOWA—Has authorized Young & Stanley, Muscatine, Iowa, consulting engineers, to make surveys and estimates of cost for new city-owned electric light and power plant, and plans early financing.

WISCONSIN RAPIDS, WIS. — Pigeon River Lumber Company, care of John Jenswold, Jr., 703 Palladio Building, Duluth, Minn., representative and attorney, plans hydroelectric power development on Pigeon River, running between Cook County, Minn., and Province of Ontario, comprising construction of series of dams, generating station of 20,000 hp. capacity, transmission lines and power substation for lumbering and wood pulp mills to be operated in neighboring district. Estimated cost $2,500,000. Application has been made for permission.

YALE, TENN.—St. Louis & San Francisco Railway Company, Frisco Building, St. Louis, Mo., plans construction of new block signal and interlocker electric system between Yale, Tenn., and New Albany, Miss., about 75 miles, estimated to cost $200,000, in connection with 1935 expansion and improvement program.

How many do *you* remember?

(*A Lesson for Advertisers*)



ABOVE are listed ten of the best-advertised people of the year 1929. They made newspaper front pages all over the land—which is more than money can buy for any advertiser.

Yet how many can you identify today?

If your advertising ceased when the New Era passed out, and you're under the impression that your prospects haven't forgotten you, let this be a gentle reminder. Not only have 1929's buyers forgotten what you told them five years ago, but today there's a new crop of buyers who never even saw those sales messages of yours!

If your product is worth selling today, it's worth advertising today. Those who sell to business and industry can do it for a modest sum . . . if they choose the "waste-proof way"—through McGraw-Hill Publications. Here you pay to reach the men who buy, and only the men who buy, in the worthwhile companies in your field.

Give your product a break, your sales force some inspiration, your competitors some real competition—with consistent advertising in McGraw-Hill publications.

* *Just so they won't keep you awake tonight* . . . 1. Captain of the S. S. America, who made a thrilling rescue at sea . . . 2. Seattle girl who married a Hindu Monarch . . . 3. Northampton, Mass., philosopher cobbler and friend of Pres. Coolidge . . . 4. Sister of Vice-President Curtis . . . 5. Governor of Massachusetts at time of Sacco-Vanzetti trial . . . 6. Flier who crossed the Atlantic with Roger Q. Williams . . . 7. Commander of the Graf Zeppelin . . . 8. Was married to John Coolidge . . . 9. Asst. U. S. Atty. Gen. in charge of prohibition enforcement . . . 10. 100-year old Grand Sachem of Tammany Society.

McGRAW-HILL PUBLISHING COMPANY, Inc.

330 West 42nd Street, New York City

American Machinist
Aviation
Bus Transportation
Business Week
Coal Age
Chemical & Metallurgical Engineering
Construction Methods
Electrical Merchandising
Electrical West
Electrical World
Electronics
Engineering and Mining Journal
Engineering News-Record
Food Industries
Factory Management and Maintenance
Metal and Mineral Markets
Power
Product Engineering
Radio Retailing
Textile World
Transit Journal

Stud Terminals Superior

[*Continued from page 33*]

the expense of replacing the transformer. It facilitates the periodic inspection and reconditioning of transformers in the repair shops. After disconnecting the leads from the studs and removing the bushings, the windings may be lifted from the tank and thoroughly cleaned. Reassembling the transformer requires no new material other than a few inexpensive gaskets. It is estimated that these economics will result in a 30 per cent reduction in the cost of transformer maintenance.

Five-Year Record of Transformer Bushings

These figures include transformer replacements on account of coil failures, lead failures, broken bushings or any transformer condition which is liable to cause a service interruption.

Year	Per Cent of Transformers Requiring Repairing and Consequent Replacement: Stud-Type Bushings	Lead-Type Bushings
1929	1.8	1.7
1930	0.38	1.7
1931	0.15	1.4
1932	0.19	1.3
1933	0.42	1.4
Five-year annual average	0.31	1.5

A development along more conventional lines has been the co-ordination of the bushing with the coil insulation. The stud-type bushing is so designed that lightning will cause a flashover of the bushing outside the case rather than a flashover inside or a breakdown of the coil insulation. This is a constant co-ordination. With the old lead-type construction, in which the entrance dielectric consisted of the bushing plus the insulation of the lead, the flashover voltage varied due to the deterioration of the lead insulation through the bushing.

•

Moe-Bridges Reorganized

Announcement has been made by S. Deutsch, in behalf of the financial and manufacturing interests associated with him, of the acquirement of the Moe-Bridges Company of Milwaukee, for more than fifteen years manufacturers of electric lighting fixtures. A new Wisconsin corporation known as the Moe-Bridges Corporation, headed by Mr. Deutsch, has been formed to take over the assets, manufacturing facilities and personnel of the previous organization.

WHY...
this Varnished Tape meets exacting specs

POWER COMPANIES and electrical manufacturers who must have varnished tape of exceptionally high quality have found in Empire Varnished Tape the answer to their needs.

Why? Because this tape to an unusual degree possesses almost any *combination* of varnished tape characteristics desired. It meets exacting requirements as to dielectric strength, tensile breaking strength, elongation, pliability, finish, uniformity, resistance to aging, and resistance to the severe conditions encountered in making joints and splices.

We would welcome an opportunity to send you samples for test. Empire Varnished Insulation is available in yellow or black, straight or seamless bias cut, in tape form or in full width materials.

Mica Insulator Company, 200 Varick Street, New York, N. Y.; 542 South Dearborn Street, Chicago, Ill; 1330 Schofield Building, Cleveland, O.; *Branches at* Birmingham, Boston, Cincinnati, Los Angeles, San Francisco, Seattle. *Canada:* Montreal, Quebec; Toronto, Ontario

---------- SEND FOR USEFUL INSULATION DATA ----------

MICA INSULATOR COMPANY

(Mail to our nearest office) Please mail without obligation on my part your "Empire" Price List No. 95

Name_____ Company_____

Address_____

PRODUCT INDEX

AIR COMPRESSORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

AIR-CONDITIONING EQUIPMENT
Frigidaire Corp., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Kelvinator Corp., Detroit, Mich.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.

AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti, Inc., New York, N. Y.

ANALYSES, REVENUE
Recording & Statistical Corp., New York, N. Y

ANCHORS, GUY
Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa.
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.

APPLIANCES, HEATING
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York, N. Y.

BATTERIES, STORAGE, ALL APPLICATIONS
Electric Storage Battery Co., Phila., Pa.
Gould Storage Battery Co., Depew, N. Y.

BATTERIES, STORAGE, AUTOMOTIVE
Firestone Tire & Rubber Co. Akron, Ohio.

BATTERY CHARGING APPARATUS
General Electric Co., Schenectady, N. Y.

BEARINGS, ROLLER
Timken Roller Bearing Co., Canton, Ohio.

BLOCKS, LINEMEN'S CABLE STRINGING
Western Block Co., Lockport, N. Y.

BLOCKS, METER TEST
States Company, Hartford, Conn.

BOILERS, STEAM
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

BOXES, FUSE
G & W Elec. Specialty Co., Chicago, Ill.
General Electric Co., Bridgeport, Conn.

BRACES & STRAIN INSULATORS, WOOD
Hubbard & Co., Pittsburgh, Pa.

BRACKETS & WIREHOLDERS, INSULATED
Hubbard & Co., Pittsburgh, Pa.

BRUSHES, CARBON
National Carbon Co., Cleveland, O.

BURNERS, OIL, GAS, PULVERIZED FUEL
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y

BUS BAR SUPPORTS
Burndy Engineering Co., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Pacific Elec. Mfg. Corp., San Francisco, Cal.
Schweitzer & Conrad, Inc., Chicago, Ill.

BUS BARS & TUBES
American Brass Co., Waterbury, Conn.

CABLE, ALUMINUM
Aluminum Co. of America, Pittsburgh, Pa.
General Cable Corp., New York, N. Y.

CABLE, NETWORK
Rockbestos Products Corp.,, New Haven, Conn.

CABLE, PAPER INSULATED
American Elec'l Works, Phillipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite-Callender Cable Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.

CABLE, PARKWAY
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Okonite Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, STEEL STRAND
American Steel & Wire Co., Chicago, Ill.
Indiana Steel & Wire Co., Muncie, Ind.
Roebling's Sons Co., J. A., Trenton, N. J.

CABLE, SUBMARINE
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
Okonite Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, VARNISHED CAMBRIC
American Elect Works, Phillipsdale, R. I.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite Co.,, Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

ABLE ACCESSORIES
G & W Elec. Specialty Co., Chicago, Ill.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Line Material Co., South Milwaukee, Wis.
Metropolitan Device Corp., Brooklyn, N. Y.

CABLE END BELLS
G & W Elec. Specialty Co., Chicago, Ill.

CABLE FIREPROOFING
Johns-Manville Corp., New York, N. Y.

CAPACITORS
General Electric Co., Schenectady, N. Y.
Products Protection Corp., New Haven, Conn.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.

CHOKE COILS
American Transformer Co., Newark, N. J.
General Electric Co., Schenectady, N. Y.

CIRCUIT BREAKERS, CARBON
I-T-E Circuit Breaker Co., Philadelphia, Pa.

CIRCUIT BREAKERS, OIL AND AIR
Condit Electrical Mfg. Corp., Boston, Mass.
General Electric Co., Schenectady, N. Y.
Pacific Elec. Mfg. Corp., San Francisco, Cal.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.

CIRCUIT BREAKERS, THERMAL
I-T-E Circuit Breaker Co., Philadelphia, Pa.

CLAMPS, CABLE
Brewer-Titchener Corp., Cortland, N. Y.

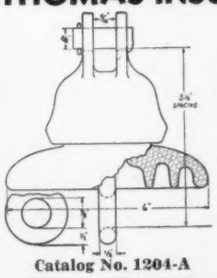
CLAMPS, GUY
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.

Stocks for Immediate Delivery

Through Graybar's 76 Warehouses

Graybar Quality — Distributed and guaranteed by Graybar Electric Company — Since 1869

THOMAS INSULATORS



A Thomas Quality 6" distribution unit. Combined M & E strength rating 10,000 lbs.

Catalog No. 1204-A
THE R. THOMAS & SONS CO.
LISBON, OHIO

Simplex Jacks

have proved through
36 Years of Service
that their design, materials and construction justify
"Unconditionally Guaranteed"

Templeton, Kenly & Co. Ltd. Chicago — Stocked by Graybar

Crapo GALVANIZED PRODUCTS

STEEL STRAND
GUY AND MESSENGER
Telephone and Telegraph Wire

Crapo Galvanized Steel Strand is quickly, easily and economically served. Its *pure zinc* coating is so adherent and so ductile that it withstands vigorous bending and twisting without cracking or peeling. This insures corrosion resisting joints, longer years of service, lower maintenance costs.

Crapo Galvanized Steel Strand and Telephone and Telegraph Wire are available in all standard grades and sizes.

INDIANA
STEEL & WIRE CO.
MUNCIE, IND.

OSHKOSH

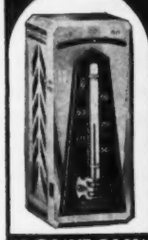
POLE LINE CONSTRUCTION TOOLS
LADDERS

Peavies	Shovels and Spoons
Cant Hooks	Pike Poles
Lug Hooks	Extra Handles
Pole Supports	Reels
Tree Trimmers and Saws	Diggers
Tamping Bars	Barricades
Digging Bars	Warning Signs

Sold and Stocked by
GRAYBAR ELECTRIC CO.
Manufactured By
LEACH COMPANY, Oshkosh, Wis.

MERCOID SENSATHERM

LOW VOLTAGE THERMOSTAT
EXTREMELY SENSITIVE



AN OBJECT OF BEAUTY AND MECHANICAL PERFECTION

Operates on a temperature variation of ½ degree above or below the point set (total differential 1°). Equipped with a mercury enclosed contact switch which is actuated by means of a permanent magnet. Not affected by dust, dirt or corrosive gases. Used wherever accurate and dependable room temperature control are required

Write for Bulletin No. 100

THE MERCOID CORPORATION
Sole Manufacturers of The Mercoid Switch
4209 Belmont Avenue -:- Chicago, Illinois

Graybar Quality — Distributed and guaranteed by Graybar Electric Company — Since 1869